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The Bank Rate Tribunal Evidence: A Symposium

The evidence taken by the Tribunal of Inquiry into allegations of a "leakage" of information about the increase in Bank rate to 7% on September 19th, 1957, contains much that is of interest not only to economists but to other social scientists as well. Its publication prompted members of the Faculty of Economics and Social Studies in the University of Manchester to hold a series of seminars, to explore the evidence successively from the point of view of the economist, the political scientist, and the sociologist. The three papers which follow are the consequence of the experiment.

AN ECONOMIST'S VIEW OF THE BANK RATE TRIBUNAL EVIDENCE

I

The Bank Rate Tribunal of December 1957 was set up to investigate particular allegations about improper disclosure of information about the raising of Bank Rate. But in the course of the very extensive evidence given to the Tribunal, interesting and important information was given about the working of the Bank of England, the City, and the Treasury, information which it would be extremely difficult to obtain by the ordinary process of research. In this article an attempt is made to distil and comment on some of the information likely to be of interest to the economist. Some of the topics of interest have already been discussed in two articles in *The Banker*[1], and these will not be referred to in detail here.

Although we are not here concerned with the particular allegations which the Tribunal was investigating, these have to be kept in mind in trying to use the evidence for other purposes. Witnesses were being asked to reveal and justify in detail their behaviour and actions during the crucial period, and in doing

[1] "The Bank of England from Within" and "New Light on the City", *The Banker*, Vol. CVIII (March 1958). The first of these discussed the responsibility for fixing the Bank Rate, Bank Rate as a weapon, and the problem of dual loyalties of Directors; the second discussed the impact of the September drain on four City houses, Lazard's liquidity crisis, the factors influencing foreign deposits in London, the underwriting of new issues, and the limitations on the Union Discount Company's freedom of market operations.

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this they were led to make revealing statements. But, of course, they knew all the time what the Tribunal was after, and this knowledge may have had an important influence on the slant they gave to their answers. This is particularly important in relation to one topic which will be discussed later in this article —the view held by the City on the significance of Bank Rate as an instrument of economic policy. In using the evidence given to the Tribunal to form a view on this, one must remember that there might to a feeling, at least in the minds of some of the witnesses, that the answer "yes" to the question "Did you expect Bank Rate to go up?", would merely lead to further questions about why they held this view and whether in fact they had had access to inside information. Much simpler, therefore, to answer "No" to the original question and to avoid further questioning. It is not suggested that witnesses were consciously telling lies; but that there might easily have been a bias in their answers, particularly when one bears in mind that they were being asked questions about opinions they held three or four months earlier.[1]

There is some support for this view in the proceedings of the Tribunal. When one witness who sold a substantial volume of gilt-edged on the afternoon of Wednesday, September 18, appeared to be unwilling to commit himself when pressed by Mr. Milner Holland, a member of the Tribunal, to state specifically whether the knowledge that a decision on Bank Rate might be made the next morning played some part in his thoughts, Mr. Holland said: "I am not quite sure, but speaking for myself, I do not think it is yet a crime to have thought the Bank Rate might go up. You did, in fact, ring[2] for that very reason"[3] [9794.][4] The witness then replied " Yes, that was so".

The second general point to keep in mind in using the evidence, is that the widest publicity was given to the proceedings

[1]The Bank Rate was increased to 7 per cent on September 19, 1957. The Tribunal was appointed on November 14 and heard evidence from December 2 to December 20, 1957.

[2]To give instructions to sell.

[3]i.e., that "you thought there might be a rise in the Bank Rate" [9793].

[4]The references throughout are to question numbers in "Proceedings of the Tribunal appointed to Inquire into allegations that information about the raising of Bank Rate was improperly disclosed". H.M.S.O., December 1957.

of the Tribunal in the Press. The veil which normally conceals the working of the City from public gaze was quite suddenly torn aside. Every member of the public was being allowed to watch the detailed scrutiny of affairs of which he normally knows little or nothing. In these circumstances important witnesses might have felt that the City was on trial before the public in a general sense. It would be only natural in these circumstances for there to be a "closing of the ranks".

II

The Role of the Bank, The Treasury, and The Cabinet in the Bank Rate Decision

The discussion about economic policy which finally led up to the Bank Rate change and the other measures of economic policy[1] announced on September 19, 1957, revolved round three separate centres of the Government machine in the Bank of England, the Treasury and the Cabinet.

In July the Chancellor "gave instructions to the Treasury to consider possibilities of checking inflation by taking firmer control of the money supply" [10635] and on August 7 "that during his absence abroad a study should be made in the Treasury of the possibility of bringing about a measure of deflation in the economy" [10570]. Sir Roger Makins, Joint Permanent Secretary of the Treasury, had two talks with the Governor of the Bank on August 8 and 12 and "told the Governor the way the Chancellor's mind was working" [10572]. There was a further meeting with the Governor, and this time with the Deputy Governor as well, on August 22, at which there was a discussion of "the studies which the Treasury had made in accordance with the Chancellor's instructions" [10574] and at which the Governor gave "his views on the desirability of a rise in the Bank Rate" [10575].

The Governor was on holiday from August 24 to September 14, and during this period Mr. Mynors, the Deputy Governor, acted as Governor. Sir Roger Makins was also on leave of absence from August 29 to September 5. During the period from August 28 onwards, Mr. Mynors kept the Committee of the Treasury and the Court of the Bank of England informed about the measures

[1]To hold down the total of investment in the public sector and the average level of bank advances.

to deal with the financial situation that were under discussion and told members of the Committee that these might eventually include action on Bank Rate.[1] Mr. Mynors discussed the situation further with Sir Roger Makins on his return from leave on September 6. During the week beginning September 9 there were discussions with the clearing banks on the proposal to limit bank advances. On September 12 and 13 Mr. Mynors had further discussions with the Chancellor and Sir Roger Makins about Bank Rate, and it seems that it was at this stage that the timing of the Bank Rate increase, although not its extent, was considered in relation to the timing of the announcement of the other financial measures to be taken by the Government.

On September 14 the Governor returned from holiday and from that stage onwards the pace quickened and the network of consultation became even more intricate. The Governor and Deputy Governor spent Saturday together, returned to London on Sunday (September 15) where they saw Mr. Parsons, the Executive Director of the Bank, and at 6 o'clock in the evening the Chancellor and Sir Roger Makins. At this meeting the figure of 7 per cent was first mentioned with the statement by the Governor that his provisional view was in favour of an increase to this figure [7605]. The Chancellor asked the Governor to give the Bank's firm view by the following evening.

During the morning of Monday, September 16, the Governor consulted some of the members of the Court[2] and told them that he proposed, subject to the Chancellor's approval, to recommend a 2 per cent increase in the Bank Rate on September 19. The same evening (Monday, September 16) he saw the Chancellor, who had Sir Roger Makins and Sir Leslie Rowan with him, and told him, that although he had not yet consulted all his colleagues, he could give the firm view that the Bank considered an increase in Bank Rate to 7 per cent on September 19 desirable [7631 and 7632]. The Chancellor asked the Governor to present the arguments for that view "which he did on the morning of September 17". The Governor, having in the meantime consulted further members of the Court, confirmed this view at another

[1]He also wrote to absent Directors of the Bank on September 3.

[2]Lord Bicester, Mr. Eley, Sir Charles Hambro, Mr. Sanderson, Mr. Babington-Smith and Lord Kindersley.

short meeting with the Chancellor the same afternoon (at about 2.15). Sometime on the 17th there was a meeting in the Treasury, with the Chancellor, the Economic Secretary and "other Treasury officials", at which discussion took place about the raising of the Bank Rate to 7 per cent [10604].

At this stage the Cabinet comes into the picture. At a meeting at about 3 o'clock on Tuesday, September 17, the Cabinet considered the terms on which the Chancellor would announce the other economic measures which the Government were intending to take, and for the first time the question of Bank Rate was raised. It was agreed that this should be left for further discussion between the Prime Minister, the Chancellor and the Governor. At 9 p.m. that evening there was a meeting at 11, Downing Street attended by the Chancellor, the Governor, Sir Roger Makins, Sir Edmund Compton and Mr. Maude; followed at 10 p.m. by a discussion at 10, Downing Street with the Prime Minister, at which the Chancellor, the Governor, Sir Roger Makins, and Sir Edmund Compton, and Mr. Bishop[1] were present. After some discussion "the Prime Minister said he would not make up his mind whether the Government should agree to the Bank Rate being raised and, if so, to what figure, until the following morning" [10612]. The next morning, Wednesday, September 18, the Chancellor saw the Prime Minister again and it was then agreed that an increase to 7 per cent "would be justified".[2] The Governor was informed of this at about noon on Wednesday, September 18.

At 12.30 on Wednesday, September 18, the Committee of the Treasury of the Bank of England met, the Governor and Deputy-Governor proposed the increase in Bank Rate to 7 per cent and this was approved for recommendation to the Court the following day. On Thursday morning at a Cabinet meeting starting at 10.30 the Prime Minister informed the Cabinet that he had reached the conclusion that the Government should accept the view of the Bank of England that Bank Rate should be increased to 7 per cent [10697]. Finally the Court of Directors

[1]The Prime Minister's private secretary.

[2]There is no clue in the evdence to indicate whether the Prime Minister consulted anyone else about the proposed change, in the interval between the two discussions with the Chancellor on Tuesday evening and Wednesday morning.

of the Bank met on Thursday, September 19, at 11.45 a.m. and approved the proposal of the Committee of the Treasury that Bank Rate should be raised from 5 to 7 per cent.

This outline of the events leading up to the final decision to increase Bank Rate raises three interesting issues :

(1) the relative roles of the Treasury and the Bank,
(2) the position of the Cabinet in relation to the decision;
(3) the contribution made by the Directors of the Bank in advising the Governor.

On the first issue the evidence before the Tribunal does not in itself point to any firm conclusion. There is not sufficient information revealed in the evidence to assess the relative importance of the roles played by the Bank and the Treasury in the final decision, or indeed where the main initiative came from. There is no disclosure of the kind of discussion or analysis that went on inside the Treasury or among the Bank's staff, which led to the final recommendations, or what alternative policies, if any, were looked at and rejected. Certainly there is no evidence here to suggest that there was a distinct Treasury or Bank of England view, or if there was, how the difference was resolved in the final decision. The evidence merely gives us the formal moves, telling us who was consulted and informed, and when.

It may be significant that Sir Robert Hall, Economic Advisor to the Government, is not mentioned by name in the evidence as taking part in any of the high level discussions between the Bank and the Treasury and the Prime Minister.[1] But in the evidence there is a reference to at least one meeting in the Treasury[2] at which discussion took place about the raising of the Bank Rate to 7 per cent when "other Treasury officials" were present, and Sir Robert Hall may have been among these. The Tribunal was given written statements from Civil Servants in the Treasury who in the course of their duties necessarily had prior knowledge of the increase in the Bank Rate, but the names of these Civil Servants are not revealed. For although the Minutes of Evidence taken before the Tribunal have been published in

[1]The three Senior Treasury officials mentioned by name are Sir Roger Makins, Sir Edmund Compton, and Sir Leslie Rowan.

[2]On September 17.

full, written statements and other documents presented to the Tribunal unfortunately are not included in the publication.

The evidence is more revealing on the role played by the Cabinet, and we have in the Chancellor's evidence for the first time a statement of the constitutional position. It is worth quoting some of the questions and answers in full.[1]

10675 Of course, responsibility for varying the Bank Rate rests with the Court of the Bank of England?—It rests formally with the Court of the Bank of England and the Governor, but of course it is normally—it is always done in consultation with and with the approval of the Chancellor of the Exchequer.

10678 At about 3 o'clock on Tuesday, September 17, did the Cabinet consider the terms on which you would announce the other economic measures which the Government were intending to take, that is to say the measures other than the Bank Rate?—They did.

10679 In the course of the Cabinet's discussion was the question raised whether those measures would be sufficient by themselves to meet the economic situation?—It was.

10680 Or whether they should be reinforced by any increase in Bank Rate to either 6 per cent or 7 per cent?—Yes.

10681 *Was it pointed out that, by tradition, variation of Bank Rate is not a matter for decision by the Cabinet? That was, yes* [2]

10682 Was it agreed that the point should be left for further discussion by the Prime Minister with you?—That was the arrangement.

10683 And with the Governor of the Bank of England?—Yes.

There follows a few questions and answers about these discussions, and then

[1]The answers are by the Chancellor of the Exchequer to questions put by the Attorney-General.

[2]My emphasis.

10697 Were the Cabinet then[1] informed that the Prime Minister had reached the conclusion that the Government should accept the view of the Bank of England that Bank Rate should be increased to 7 per cent? —That information was given to the Cabinet.

10698 Did the Cabinet express approval of that conclusion? *—They took note of it.*[2]

This gives a very minor role to the Cabinet and other Ministers particularly concerned with economic affairs such as the Minister of Labour and the President of the Board of Trade, in discussion and decision about one of the most important instruments of economic policy.

The Governor stated that he attached considerable importance to the advice that he received from the Directors of the Court whom he consulted. His major argument was that " the problem that we were facing at that moment was a major exchange crisis, and the Directors whom I wish to consult in addition to the members of the Committee of the Treasury, were those directors who were particularly qualified to give me an opinion about the likely effect of a 7 per cent Bank Rate on Sterling" [7733] and "The specific point here, of course, was this: was a rather sensational rise in the Bank Rate from 5 per cent to 7 per cent likely to be a really effective measure along with the other measures under consideration—which in my judgement it was—or was there a risk that such a sensational measure as a 2 per cent rise from 5 per cent to 7 per cent might be regarded on the exchanges as some sort of panic action?" [8115]. Unfortunately the evidence does not reveal what advice and answers the colleagues that he saw gave the Governor, nor how they assessed whether the foreign exchange market would be reassured or driven into a panic by the proposed "sensational" increase. Of course an indication of how they themselves would react might be important information since the Governor might take this as a fair sample of the likely general reaction in the City. On this view the role of the part-time Directors is important not because they are experts in interpreting the economic and financial situation, but because they represent a cross section of

[1]At the meeting of Thursday, September 19.

[2]My emphasis.

the City, and give the Governor a valuable insight into the City's changing opinions, hopes and expectations.

It is perhaps interesting to note that the Governor did not state that he needed information and advice on how this dramatic raising of Bank Rate might affect the internal economic situation. Indeed he did not consult those Directors, such as Mr. Cadbury, Sir Alfred Roberts and Sir Harry Pilkington, who would be more concerned with this aspect of the policy, until the afternoon of Wednesday, September 19. By this time he had already committed the Bank to "the firm view" that an increase in Bank Rate to 7 per cent on September 19 was desirable. And judging from the timing of the interviews[1] with these three Directors, the "consultation" can have amounted to little more than informing them of the decision.

III

The City's View of the Economic Situation in the Summer of 1957

As has already been stated, there is little information in the evidence about the kind of diagnosis of the economic situation which was made in the Treasury or in the Bank in the summer of 1957, but there are many revealing statements by witnesses from the City about their view of the economic situation at the time, and their opinion of the Government's handling of it.

One can give only a selection of the views expressed, but the following seem representative:

Mr. W. J. Keswick (in a letter in September to Mr. Hugh Barton, Managing Director of Jardine, Matheson and Co., Hong Kong):

"I believe the trade figures are dreadful and one hears on all sides ugly rumours about devaluation" [3850].

Mr. H. J. Young, recalling a statement about the financial position of Britain by Mr. W. J. Keswick at a meeting on September 16:

"As far as I can remember, he mentioned the adverse balance of trade, the loss of dollars . . ." [3339].

Lord Kindersley, recalling his attitude at a meeting on August 28:

[1]He saw Mr. Cadbury at 2.10 and Sir Alfred Roberts at 2.20 p.m.

"I only wanted to say that I had just arrived back from Canada. I had left it three days earlier because I was really worried by the attitude of Canadian bankers towards the pound sterling in general, towards our inability to stop the wage spiral, and our ineffective (if I may say so) Government at the time" [7343].

Mr. H. R. Roberts (Senior Assistant General Manager of the Royal Exchange Assurance Company) replied:

"That, I am afraid, is what I thought" in answer to the following question, "were your own thoughts on the matter on more general lines, and did you rather come—so you say—to the conclusion that the situation was getting out of hand and that the Government either did not know what to to do put it right, or if they did know they thought it would be politically inexpedient to do it" [7030].

Mr. C. A. S. Cooper (Investment Secretary to the Royal Exchange Assurance Company):

"While on holiday[1] did you do your best to keep yourself well informed on financial matters?—I did. While on holiday did you study the Press and especially the financial columns of the Press?—I did. Did you form a view while you were on holiday about the situation?—I did. I think you have said that you formed the view that Her Majesty's Government handling of the situation was inadequate?—I certainly did" [6578–6581].

The impression created by these statements and similar ones by other witnesses from the City, is that City opinion was very much influenced in its view by superficial evidence about the economic situation, and by general opinion here and overseas of the economic state of the country. For the purposes of their own affairs this may have been sufficient. No deep analysis of the longer-run economic situation is needed to support the conclusion that if others seem to be worried about the economic situation and do not have confidence in the Government's handling of it, there may be a crisis, and it is as well to be prepared for it by being liquid.

Nonetheless it is somewhat surprising that not a single witness who gave evidence before the Tribunal appeared to be aware

[1]From August 28 to September 16.

that the underlying trading position of this country was, for the time being anyway, surprisingly good, and that the balance of payments on current account was expected to be substantially favourable in the second half of the year 1957.[1] There had, it is true, been discussion throughout the summer about the menace of continuing inflation and fears had been expressed in many quarters about what would happen to the balance of payments if inflation continued at the same pace into 1958. It looks as if when speculation against sterling started in the summer and the foreign exchange reserves began to drain away, many people in the City immediately jumped to the conclusion that this was because our wage costs were getting out of hand, that the Government had not the courage to do anything about it, and so our trade position was deteriorating; and speculation against the pound was merely making the position worse. One wonders, for example, whether Lord Kindersley in his discussions with Canadian and United States bankers which he frequently referred to in his evidence, explained, when they expressed such concern about the future of sterling, that the trading position of this country was really very strong, and that the pressure against sterling was almost wholly speculative?

Yet one must be careful in suggesting that the City as a whole was by its own sense of disquiet contributing to the speculation against sterling for which wicked Continental Bankers are usually blamed! The witnesses who appeared before the Tribunal were from this point of view a biassed sample. They were in fact called to give evidence because they had been concerned with sales of gilt-edged during the crucial period. To give the right balance it is perhaps appropriate to quote the following statement made by the Governor of the Bank: "The surprising thing to me was that there was not very much heavier selling and more disquiet in the City at the time."[2]

[1]In the event there was a favourable balance on current account of £154 million in the second half of 1957, and of £272 million for the year 1957.

[2]September 16 and 17.

IV

The City's View of the Importance and Effectiveness of Bank Rate as an Instrument of Policy

It has often been argued that although changes in Bank Rate and other interest rates may have negligible direct effect on economic activity, yet they do exercise a substantial indirect effect by operating as a danger signal, a warning light, to the business community. On this view a dramatic increase in Bank Rate might be important, not only to impress overseas speculators that the Government means to defend Sterling but also to convince the business community at home that the Government really means to take charge of the economic situation. It is interesting, therefore, to examine what importance witnesses attached to a change in Bank Rate. The following represent some important expressions of opinion on this point.

Lord Kindersley:

"No. I thought the other side of the argument was, what the Government were going to do, what the Government would say, and what they would say about spending and how they would face up to wages in the nationalised industries, was more important than Bank Rate, and I would not have liked to have seen the Bank Rate raised without something like that going with it" [7397].

Mr. J. V. O. Macartney-Filgate (a Managing Director of Lazards):

"The opinion I formed was that if any steps were taken, it was more likely to be a restriction of hire purchase, further credit restriction, a general tightening up. I did not expect Bank Rate to go up, although I thought it might be added to the general programme. I could not see that it was going to do any good" [5924].

Mr. D. Meinertzhagen (a Managing Director of Lazards):

"Because I did not believe that Bank Rate by itself was a solution to our problems, and I did not know what other measures the Government might take to deal with the situation. I recognised that some of them might involve a rise in Bank Rate, but I looked upon Bank Rate as a subsidiary matter to other measures which Government might take" [6088].

Sir George Bolton (Director of the Bank of England, Member of the Committee of Treasury, and Executive Director from 1948 to February 1957):

"If the only information reaching foreign markets had been the possibility of a sharp rise in the Bank Rate, in my opinion it might have had even an adverse effect on Sterling, certainly not a good one" [8443].

Dr. Hans Hock (a Managing Director of Singer and Friedlander, Merchant Bankers):

"How can the Chancellor", I said, "face his fellow bankers in Washington unless he does the maximum he can do at home? In fact I never thought of Bank Rate. I thought of general financial measures" [8165].

(Attorney-General): "But the maximum he could do at home would comprise raising the Bank Rate, would it not? —(Dr. Hock): It would be one of the possible measures. In fact it is well known in the City that the Governor does not trust Bank Rate as a weapon in fighting inflation. He has said so at the last Bankers' dinner and he gave reasons why he did think it was not effective. I therefore thought much more in terms of some monetary measures with the intention of mopping-up surplus liquidity of the banks" [8166].

If the statements of these gentlemen reflected a wider City opinion, then, at the time at least, confidence in the Bank Rate as an instrument of policy did not seem to be running very high.

V
The Basis of Decision Taking

Many witnesses were asked by the Tribunal to give an account of their sales of gilt-edged during the crucial days before the Bank Rate increase, and were pressed to give an explanation of the reasons for their decision to sell. We have here, therefore, one of the rare occasions when business men were asked to explain in public the basis on which they took their decisions.

The cases before the Tribunal fall roughly into two categories. Firstly, those cases, mostly on a small scale, where someone, acting on behalf of his firm or on his own account, took a particular short-run view of the market and decided to sell. Secondly, the cases where a major decision was taken in a substantial

business to sell gilt-edged on an appreciable scale in order to secure more liquid funds. It is the second set of cases that is more interesting, for here we see an attempt by witnesses to explain how they came to decide that they needed to be more liquid and the scale of selling that they thought necessary to meet the situation.

The important transactions were by Matheson & Co., Lazards and the Royal Exchange Assurance. In each of these cases the Attorney-General in trying to discover the basis of the decision to sell, cross-examined the witnesses in great detail about the operations of the firm, quoting detailed figures of transactions, deposits, etc. In nearly all cases witnesses found it difficult to justify decisions in terms of this kind of detailed analysis of figures, and were inclined to fall back on statements about a general feeling or sense that it was the appropriate thing to do. The following are some examples of this:

Mr. A. D. Marris (a Managing Director of Lazards):

"What I think I would say in answer to your questions is that it is not just the relationship between call money and deposits that one has to take into account; one has to take into account acceptances as well. One plays this tune according to ear and if you think the waves are running high you tend to want to get liquid, and I thought our deposits were low and we ought to get more liquid. It was not a considered judgment about percentages, I am afraid" [6916].

Mr. J. V. O. Macartney-Filgate (a Managing Director of Lazards):

"Yes, I think that reasoning is correct, but of course all this money which was going out and which, on the whole, was what I would call commercial money or quick turn-over money, was probably being accompanied by money coming up again for purely commercial purposes. If I wanted to sort of analyse the impact of the whole of that I would have to do quite a lot of research.

Q. And you did not do it in this case?—I did not do it because, as I say, one felt what was going on. [5920 and 5921].

Mr. T. H. Brand (a Managing Director of Lazards):

"You see, it is really—I do not want to overstate it, but it is an intolerable nuisance to have to look at these deposits and liquidity figures in my mind. They should not crop up, particularly at a time when you are busy on other things. I hate the position where we begin to, shall I say, sell gilt-edged once a week, and that kind of thing. It may be more personal than otherwise, but I am sure that is not the way banking business should be conducted if you are free to sell. You may be pushed into it" [5541].

Mr. W. J. Keswick:

"I do not think there was anything provisional about it[1]. I think that we came to, or, if I may put it this way, we drifted to the decision that it was inevitable that we should recommend the sale of gilts" [4342].

VI

Some Minor Points

Apart from the major issues of economic interest discussed so far, there are a large number of small points of information in the evidence about the working of the City, some of which are summarised below:

(1) After-hours dealing in gilt-edged seems to be fairly widespread. One of the reasons given for this is that Boards frequently meet in the afternoon and take decisions about their investments. Jobbers quote more cautiously after 3.30 because they are less closely in touch with movements on the floor, and in the ordinary run of gilt-edged the difference in price quoted might be as much as one-sixteenth [1904–8].

(2) The gilt-edged market is not as 'perfect' as is usually represented in text-books. Jobbers' quotations are for a 'normal quantity', ideas about what is 'normal' varying with circumstances, but usually for between £50,000 –£100,000 of stock. For larger quantities the jobber quotes a special price and would usually know *before* quoting a price whether the enquiry was for a sale or purchase. In one example given by Mr. Hunter (a partner in

[1]The decision to sell.

the stockbroking firm of L. Messel & Co.), he was able to get a price of $96\frac{5}{8}$ for £50,000 of 3 per cent Exchequer stock, but only $96\frac{1}{4}$ for £500,000. [2065–9 and 4869–71].

(3) The Government broker never deals on behalf of the Bank of England on a Thursday morning before the Bank Rate announcement.

(4) The Capital Issues Committee grant approval for an issue upon the condition that the date of the issue has to be fixed with the consent of the Bank of England [7762].

(5) The membership of the Committee of Treasury of the Bank of England, which meets each Wednesday to decide on what recommendation about Bank Rate to make to the Court on the following day was as follows in 1957:

The Governor, the Deputy Governor, Lord Bicester, Sir John Hanbury-Williams, Basil Sanderson and Sir George Bolton.

Lord Kindersley was not a member and explained why in the following statement.

"Because I am Governor of the Royal Exchange and we hold our Courts at the same time as they hold their Treasury Committee, and I would have to retire from the Royal Exchange if I was to go on to the Treasury Committee and I would prefer not to" [7557].

(6) The declaration made by every member of the Staff of the Bank on appointment, the rule with regard to secrecy which all staff have to sign, and the declaration signed by the Agent of a Branch are given in full [8390, 8394 and 8397].

It is hardly surprising in view of these, that one hears so little, except on such an occasion as the Bank Rate Tribunal, about how things are managed in the Bank of England.

University of Manchester. Ely Devons.

A Political Scientist's View

I suppose that most political scientists shared with economists a mild thrill of expectation when they heard that the Tribunal had been set up. For it seemed that at last it might be possible to discover how the government and the Bank of England arrive at decisions about economic policy. There was in addition the possibility that the Tribunal might incidentally bring up to date and supplement Dr. Balogh's *Studies in Financial Organization*. But in the event these expectations were largely disappointed. The Bank of England, in spite of its Governor's recent public utterances, remains an anonymous as ever, and it is easier to learn about the views of its officials in Paris or Frankfurt than in England. And although much was learned about a number of firms and individuals in the City, it would still take several years of intensive work to piece together an authoritative answer to those fascinating questions: What is the City of London? What does it do?—and (in the light of recent continental and American experience), is its structure, and that of individual firms, well-adapted to its purposes?

Nevertheless, some information was disclosed, and certain issues were raised which call for discussion.

1. *The Bank of England and the Government*

Relations between the Bank and the Government are regulated by custom rather than by law, and appear to have changed little in the past thirty years. The Court of the Bank recognises the primacy of the Chancellor of the Exchequer and the Government under the Bank Act of 1946. But the Bank is no more tied to the Treasury than is the B.B.C. to the Post Office. As the Governor put it to the Tribunal:

> The Bank of England is the banker, agent and confidential adviser to Government over a very wide range of financial matters, domestic and international. The Bank has also a direct responsibility for market monetary management, which includes the fixing of Bank Rate and various other market operations. This is the position both in Law and practice. In Law the Court is responsible for the conduct of the Bank's affairs subject to any direction which may be

given by H.M. Treasury under Section 4 (1) of the Bank Act 1946. In practice the Court of the Bank accept and discharge these responsibilities, in consultation with Her Majesty's Government and recognising that in the last resort the policy of the Bank must conform with the general policy of Government. I am confident that this position is clearly understood between the Bank and H.M. Treasury.[1]

The day-to-day business of the Bank and its relations with the Treasury are primarily matters for the Governor and Deputy-Governor, who, as Mr. Cobbold put it, have the 'first responsibility for formulating the Bank's policy and for tendering advice to Her Majesty's Government.' The Tribunal was told nothing about relations between officials of the Bank and their opposite numbers in the Treasury, but it appears that these are not as close as those between officials of the British Transport Commission and the Ministry of Transport and Civil Aviation, or those between officials of the F.B.I. and the Treasury. Most of the ordinary business between the two bodies is transacted by the Governor or Deputy-Governor in their regular discussions with the Chancellor, or in discussions with senior Treasury officials. When any change is contemplated it is usual to ask the Governor to formulate the Bank's policy, which is then considered by the Treasury and the Government. If it is approved the Bank is free to act. If it is not approved further negotiations follow.

The most surprising fact unearthed by the Tribunal was the apparent lack of machinery for discussing the Bank's proposals for an increase in the Bank Rate once they have been formally submitted to the Chancellor. Ministers appear to have taken the view that because the Bank Act gives the Treasury, rather than the Government, power to issue orders to the Bank ; and because past Chancellors have always zealously guarded their privileges, it is at the very least a convention of the constitution that 'variation of Bank rate is not a matter for decision by the Cabinet.'[2] This meant that in the 1957 case the Cabinet was consulted by the Chancellor, but was not called upon to lay down a policy for him to follow. Since there was no Cabinet committee

[1]Evidence Q.8,040.

[2]Evidence, Q.10,681.

on economic or financial policy, the final decision was therefore taken by the Prime Minister and the Chancellor of the Exchequer as the senior Treasury ministers.

Just how important the Prime Minister's contribution was, and how unimportant that of the Cabinet, emerges clearly from the timetable of the discussions which led to the decision to raise the Bank Rate. The discussions lasted five days. On Saturday, September 14, the Governor of the Bank returned from holiday and saw the Deputy Governor. Together they saw on the following day an Executive Director of the Bank, Sir Roger Makins of the Treasury, and then the Chancellor of the Exchequer accompanied by the Financial Secretary and Sir Roger Makins. On the Monday there were further discussions at the Treasury and the Bank, as a result of which the Governor recommended an increase of Bank Rate from five to seven per cent. Next day, Tuesday the 17th, the Chancellor expounded his proposals for dealing with the economic situation and informed his colleagues of the Bank's recommendation at the afternoon Cabinet. The Cabinet, however, arrived at no decision and referred the matter to the Prime Minister and the Chancellor for further consideration. That evening the Governor, the Chancellor, and two senior Treasury officials called upon the Prime Minister to discuss the proposed increase in Bank Rate, but again no decision was reached. By next morning, however, the Prime Minister had made up his mind; his approval was conveyed to the Chancellor; and Sir Roger Makins telephoned it to the Bank.

The lack of formal machinery for consultation about such issues seems to have serious disadvantages. It tends to encourage that habit of letting things drift which was the chief complaint made against the Government by the Tribunal's witnesses. It may easily lead to serious misunderstandings of the sort which arose when Lord Cunliffe was Governor of the Bank.[1] It tends to isolate the Chancellor from the rest of the Cabinet (Mr. Thorneycroft's resignation is a case in point). And it makes it difficult for the Government as a whole to formulate a clear-cut economic policy (one wonders where Mr. Maudling fits into the

[1]There is an interesting account of Lord Cunliffe's collisions with the Government during the First World War in Lord Beaverbrook's *Men and Power 1917-1918*, London 1956, Chapter III.

picture). Indeed, it is difficult to see how, in modern conditions, any Cabinet can do without a strong economic committee to help the Chancellor to arrive at decisions and to carry them through the Cabinet. Such an economic committee certainly seems as necessary as the Defence Committee which has received such careful attention in recent years.

Scarcely less surprising was the apparent failure to recognise that the present position of the Bank is in many ways an unsatisfactory one. Over the years the Bank of England has been an extraordinarily successful central bank, and by and large the advice it has given to the Government seems to have been extremely sensible. But the structure of the Bank and its attitude to the public have been excessively old-fashioned. It still maintains its traditional secrecy, it still behaves as if it were less interested in the problems of industry than in those of the City of London, and it is still closely linked with the merchant banks. And although it has been nationalised it finds it easy to forget the fact because its directorate still so closely resembles the closed corporations which govern the bigger clearing banks, although, unlike them, it has no shareholders to worry about. Moreover, until Mr. Cobbold's recent speeches, the Bank has made no effort to persuade the public that it is doing a worthwhile job and that it is moving with the times. There has been nothing at all like the admirable monthly reports of the Deutsche Bundesbank, which survey the development of the German economy and demonstrate that the central bank is as much interested in the problems of all sections of the community as the Government itself. Indeed the Bank has been so bad a showman that there are few people, outside the ranks of those who have dealings with it, prepared to defend it against those who wish to bring it under the direct supervision of the Treasury.

Even the Bank's most wholehearted supporters seem to have made the mistake of assuming that the Bank must be defended in different terms from those used in discussing other nationalised industries or the Post Office. For good or ill, the Bank has been nationalised, and it must be judged not by the satisfaction it arouses in the City, but by the extent to which it advances the national interest. For instance, it is not helpful to argue, as Mr. Pitman, a former director of the Bank, argued in the House

of Commons, that the part-time directors of the Bank are valuable because there is 'an identity of interest between such directors and the national interest',[1] since it is in the interests of both to keep the value of the pound stable. This is simply the old and now discredited argument that the man with a big stake in the country knows better what is good for the country than the man with a very small stake, and can always be countered by the argument that the man with the big stake in the country is so busy trying to defend it that he has no time or inclination to consider the good of the country as a whole.

2. *Ministerial Interviews before the Chancellor's Statement*

The habit of divulging to interested parties the contents of important Government statements has become firmly rooted since the war; yet curiously enough it had seldom been carefully examined before the appointment of the Tribunal.[2] The investigations of the Tribunal elicited a detailed timetable of interviews[3] designed to prepare the interests concerned, the 'financial press', and the Conservative Central Office for a Government statement (although not for one about the Bank Rate). But this information, although interesting, is less important than the debate in the House of Commons about the propriety of such interviews.

The Members of the House were agreed that it was wrong that decisions should be revealed which would enable people to make money at the expense of those without access to privileged information. There are clearly some very fine lines of distinction here, as Mr. Gresham Cooke indicated when he told the House that as Director of the Society of Motor Manufacturers and Traders in 1950 he had been given advance warning of a change in the rate of purchase tax on motor vehicles.[4] But the principle is clear enough. Most of the House seem also to have been unhappy about Mr. Thorneycroft's interview with the officials

[1] H. of C. Debates, Vol. 581, col. 917.

[2] The last occasion for a full-scale review was provided by the revelations before the Lynskey Tribunal. These led to the appointment in 1948 of the Committee on Intermediaries, whose report [cmd. 7904] has been the starting-point for most subsequent academic research on British pressure groups.

[3] Report, p. 11.

[4] H. of C. Debates, Vol. 581, col. 1000.

of the Conservative Central Office. Mr. Thorneycroft defended himself on the ground that the Conservative Central Office would be faced with many enquiries, and that it would be useful for it to be in a position to deal with them.[1] But the officials themselves gave him little support, as they seem to have regarded the interview as superfluous (they were busy making arrangements for the change in the Chairmanship of the Party which took place on the same day), and Mr. Thorneycroft's former colleagues were careful not to defend him on this specific issue. Mr. Gordon Walker was, therefore, expressing a pretty widely-held view when he maintained that the decision was a mistaken one, on broad constitutional grounds:

> Our whole parliamentary democracy depends on a clear and precise distinction between the State and party machines. It is because our Governments depend on parties that they have to take immense pains not to transgress in the slightest degree the line that must be rigorously drawn between Government machine and party machine. And that line was transgressed on this occasion.[2]

Prior consultation with the T.U.C., the F.B.I., and the British Transport Commission rests upon quite a different footing. Mr. Harold Wilson cautiously said that in such cases it is 'quite appropriate',[3] but this is an understatement. Consultation with such bodies is now almost obligatory and ranks as one of the customs of the constitution. So too do interviews with journalists. These cannot be given when vital decisions like devaluation are in question, but, to quote Mr. Harold Wilson again: 'The general rule should be wherever possible to see the Lobby correspondents, because I do not believe that there is any recorded case of a Minister who has done so who has been let down. In a special case he could see City editors, but, if there is anything secret involved, not before the event, nor on a selective basis, nor individually'.[4] The case against Mr. Thorneycroft was not that

[1]Evidence, Qq. 10,725-10,728.

[2]H. of C. Debates, Vol. 581, col. 1000.

[3]Ibid., col. 855. The importance of such consultations to both ministries and outside bodies is admirably discussed by Professor S. E. Finer in *Anonymous Empire*, London 1958, pp. 21-2 et seq. See also J. D. Stewart, *British Pressure Groups*, Oxford, 1958, *Passim.*

[4]Ibid., col. 856.

he saw journalists, but that he saw them the day before the Government statement, and that he saw them individually, so increasing the risk that some of them might infer more from what he said than he intended.

3. *The Structure of the City of London*

Because the political scientist is interested primarily in the process of decision-making he is sceptical about the value of sociological analyses such as those in *Tory M.P.* and in the article by Mr. Lupton and Miss Wilson in this issue of the *Manchester School*. It is, of course, true that in England people seem to be more clannish at the top and the bottom of society than in the middle. But the 'upper classes' are not all composed of closely-knit clans like the Hatfield Cecils. There are few families not divided into factions, and fewer still that are linked by common interests and ideas rather than by social habits. And by and large men who go hunting or shoot grouse or meet at their clubs do not 'talk shop' outside business hours even when in company with business associates. (The Keswick brothers seem to me to be typical in their dislike for dealing with business questions when in Scotland.[1]) The fact that the leading City figures who appeared before the Tribunal, or who were discussed by it, were similar in social background and political outlook to the members of Conservative Cabinets is important, for generally speaking the City and the Conservative party are the strongholds of the old pre-democratic order. But it is a fact more important for politicial reformers than for political scientists. The political scientist is much more interested in the divisions of opinion within this quite large group of people. It is, for instance, of no practical value for him to know that the Earl of Crawford or the Marquess of Salisbury or the Duke of Devonshire has relations in the City—he would be much more interested if he found that they had not—unless it can be shown that this relationship has significant consequences apart from facilitating the selection of guinea-pig directors.

By and large the City is dominated by specialists who owe their position to a blend of ability, application and trustworthiness and to a certain amount of luck and skill in making use of

[1]Cp. Evidence pp. 111f.

their own and their firm's connections. But the value of hereditary connections is judged by the money they bring in and not by any other criterion. There has been such a long history of failures by firms (especially in banking) which were too much inbred or too respectable to tout for custom that the lesson of their failure has been learned. Even the ruling families in the better-known family firms, although still represented on the board, have become accustomed to leave the effective management of the firm in the hands of men who have worked their way up to the top, or of able outsiders from other walks of life.[1] The tendency for the last fifty years has been to discourage excessive inbreeding except in the case of promising young men who seem to be following in the footsteps of an exceptionably able father or uncle.[2] Thus although in a sense the City is managed by a complicated old-boy network, since it is unusual for boys leaving school to find an opening in the City if they or their school lack inside knowledge, it is essentially a City network, and the aristocratic connections of the City magnates are largely irrelevant to it.[3]

Even if the City is regarded as a closed community with its own ruling class and its own laws of succession (of which primogeniture is clearly not one), we are not much nearer explaining how the City actually operates. For the family and social connections of the City magnates explain how they came to be eligible to hold office in the City, but not what their own contribution to their firm's prosperity or to City thought has been. Nor does it tell us who makes decisions or how they are arrived at. For this much more information is required, of the sort incidentally acquired by the Parker Tribunal, than has ever been collected hitherto. No one has yet written a satisfactory account

[1]There is an interesting discussion of the problem of succession in Roger Fulford, *Glyn's 1753-1953*, London 1953, pp. 228f.

[2]For instance Lord Kindersley and the Hon T. H. Brand (now Viscount Hampden) are the chosen successors of two famous City figures, the first Lord Kindersley and Lord Brand, who did not belong to the established City dynasties.

[3]Unless, of course, some attack on the City was launched by the Government, in which case connections outside the City might be useful in getting up a campaign in its defence. In normal times City men do not have much time for politics and the City peers are not very active in the House of Lords. Lord Kindersley, for instance, did not speak during the 1956-7 session.

of the evolution of the City in the past fifty years which would enable us to account for the business connections of the great City houses, the composition of their directorates, and their different traditions. There is not even an account of the emergence of the great insurance companies as a major factor in the financial world, nor of the enormous increase in the number of directorships, which has led to the accumulation of many seemingly incompatible directorships by important individuals.[1]

What seems to be most needed is a study to follow up what Lord Kindersley and other Lazard's directors told the Tribunal about specialisation within the City. From what they said it is clear that Lazard's undertakes three separate types of business: it is a banker, undertaking all types of banking work including giving acceptances and credits and operating investment companies; it is an issuing house, with a considerable stock business; and it acts as industrial consultant to firms such as B.S.A. These three functions are linked and consolidated by means of directorships held by the individual managing directors in a variety of outside firms, some of them a direct consequence of membership of Lazard's, some a tribute to the personal qualities of the individual managing director, and some a result of family or earlier business connections.[2] The firm therefore operates at five distinct levels, each of them a suitable subject for special investigation. It forms one of the select circle of private bankers, it is one of the 'club' which handles new issues, it deals extensively in the stock market, several of its members form part of that rather ill-assorted élite which sits on the boards of the major industrial and financial companies such as Rolls Royce, British Match, English Electric, Royal Exchange Assurance, the Bank of England, Barclays Bank, and the shipping lines, whose everyday conduct is in the hands of high-powered managers; and the individual managing directors also sit on the boards of smaller companies such as form the industrial rank and file. In addition Lazard's has a number of directors, such as Lord Poole, whose functions are by no means clear, and who attend a directors' meeting once a month.

[1]There is a preliminary discussion of this in T. Balogh, *Studies in Financial Organization*, Cambridge 1947, pp. 22f.

[2]The connection with the Pearson Group I do not pretend to understand, but it is clearly important.

Lazard's is also particularly interesting because no attempt has been made to develop within it a formal machinery for arriving at decisions. The two senior managing directors have private rooms, the doors of which are usually open, opening off a larger room in which the other five managing directors have desks. Thus although each managing director is a specialist, the seven managing directors share a communal life at the office, and it is easy for any one managing director to consult his colleagues when he wants advice, or to chat with them when work is slack.[1] These exchanges of opinion are particularly valuable because the managing directors have different interests and different backgrounds.[2] There are therefore likely to be as many views expressed as there are individuals present, as was the case in September, 1957, when there was a discussion as to what action the Government was likely to take in view of the economic situation and what the firm should do to keep itself liquid.[3]

4. *Tribunals of Enquiry*

Tribunals of Enquiry set up under the Tribunals of Enquiry (Evidence) Act of 1921 cannot be said to have given general satisfaction. Indeed, much of the debate in the House of Commons on the present tribunal's report was devoted to an unfavourable comparison of tribunals with courts of law. There are two main grounds for dissatisfaction. The first and less serious is the ambiguous position of the Attorney-General as chief 'prosecutor' of his colleagues in the Government. In the past such anomalies were thought not to matter, but in recent years there has been a marked change in the public attitude to political appointments to judicial office, and to the combination of political and legal functions in the hands of the law officers. As a consequence, it seems highly unlikely, to put it at the lowest, that any future Attorney-General will be willing to act as Sir

[1] Evidence Qq. 5,697, 6,228, 6,236.

[2] Lord Kindersley is chairman of Rolls Royce and the British Match Corporation and governor of the Royal Exchange Assurance, and was a brigadier during the war. Lord Hampden was in Washington during the war as Chief Executive Officer (British side) of the Combined Production and Resources Board. Mr. Percy Horsfall was an industrialist before he joined Lazard's. Mr. Macartney-Filgate is connected with a number of Midland firms. And so on.

[3] Evidence Qq. 5,876, 5,927, 5,977, 6,198.

Hartley Shawcross and Sir Reginald Manningham-Buller have done, and every effort will probably be made to select an 'independent' barrister to adopt a rôle analogous to that of the Comptroller and Auditor-General before the Public Accounts Committee.

More important is the difficulty of conducting an enquiry in such a way that justice may be seen to be done, while yet giving those against whom vague charges are levelled an opportunity to rebut them. Many lawyers are convinced that such conditions can prevail only in a court of law, where there are strict rules about the admissibility of evidence and where there is always a clear-cut decision about the guilt of individuals. But this view seems to me to be a mistaken one. I do not see how a generalised charge of corruption or of misuse of secret information can be dealt with except by a Tribunal which can sift all the evidence, however worthless it may be, and demonstrate its value or lack of value to the public at large. For the issues raised are always questions of political morality which arouse widespread interest.

There is a parallel in the arrangements for the trial of election petitions. The subjects of enquiry in both cases are not dissimilar, usually involving broad allegations of corruption, charges against individuals which are difficult to prove or disprove, and unsatisfactory witnesses like Mrs. Campbell. Both were originally investigated by committees of the House of Commons, and both were eventually referred to a judicial tribunal as a consequence of the flagrant partiality of the Commons' committees. And in both cases there was for a time dissatisfaction about the conduct of the tribunal: in the case of Tribunals under the 1921 Act because of the early experiments by the Tribunal in conducting the examination itself, and subsequently because of the position of the Attorney-General, and in the case of the election courts because of the behaviour of two of the judges (Mr. Justice Keogh in Ireland and Mr.

Justice Grantham in England).[1] But in neither case has it been felt, by politicians as distinct from lawyers, that the ordinary courts are better capable of dealing with the type of evidence involved than the tribunals. The courts can act only where there is adequate prima facie evidence before them, whereas in election cases and in cases before Tribunals under the 1921 Act the evidence is often of the flimsiest but needs to be investigated in the public interest. The present arrangements may not be altogether satisfactory, but as Sir Henry Campbell-Bannerman pointed out in 1908 when discussing the trial of election petitions, there is no conceivable alternative available.

However perfect the tribunal, there is in any case no prospect that its course will give general satisfaction in all cases. For large sections of the public have usually made up their minds in advance what the result of the enquiry ought to be, and will be most unlikely to change their minds. Take an obvious example, the Marconi Scandal of 1912. By the time the charge that Lloyd George, Herbert Samuel and Rufus Isaacs had used knowledge gained in their official position to increase their private fortunes had been referred to a committee of the House of Commons, a very large proportion of the House of Commons and of politicians in the country generally had made up their minds on the issue. When they heard further evidence they were merely confirmed in their opinion. The House of Commons committee was divided along political lines and the scandal was only quieted by the outbreak of war. If a Tribunal like the Parker Tribunal had investigated those allegations instead of a committee of the House of Commons there can be no doubt that its verdict would have been that a grave error of judgement

[1]Keogh and Grantham were both 'political judges', a species now almost extinct. Keogh's speeches against his erstwhile political associates delivered from the bench during the trial of the Galway election petition of 1872 led to a hot debate in the House of Commons and to a change in the law by which the trial of election petitions was entrusted to two judges instead of one. Grantham, an ardent Conservative, was in the habit of making political speeches when not on the bench and of uttering injudicious remarks when on it. As a consequence he was (as *D.N.B.* puts it) 'peculiarly unfit' to try election petitions. His conduct of three cases in 1906 caused intense dissatisfaction among Liberals and led to a hostile debate in the House of Commons. Indeed, Grantham was extremely lucky to escape removal from the bench both then and in 1911, when he was publicly rebuked by the Prime Minister for a speech to the grand jury at Liverpool.

had been made. What then? The Tribunal would have been accused of taking the side of the Conservatives, and all sorts of objections would have been made about the way in which it had conducted its business. Yet the public outcry would have been no more reason for abolishing the system of investigation by tribunal than the alleged grievances of Mr. W. J. Keswick in the case of the Parker Tribunal.[1] Tribunals cannot be perfect instruments, and they must expect to encounter a good deal of popular controversy, but they are the only instrument available at the moment for upholding the standard of political morality at Westminster.

University of Manchester. H. J. HANHAM.

[1]In the House of Commons debate (cols. 871-2) much was made of these by Mr. R. T. Paget, who alleged that 'acquittals by this Tribunal are probably as lethal as convictions' and that Mr. Keswick will be remembered as 'the man who was prepared to sell his country.'

The Social Background and Connections of "Top Decision Makers"

Our interests as sociologists have led us to make use of the Parker Tribunal evidence as a convenient starting point for the analysis of some social connections between persons prominent in banking, insurance, politics, and public administration. Our choice of persons and categories was influenced by our starting point, and our enquiries were limited by considerations of time and space, and by gaps in the published sources of data. For these reasons our results are not statistically significant. But they will be of interest to sociologists, as representing the beginnings of an analysis of the social origins and interconnections of what we shall call the "top decision makers"[1] in British society. We think that economists and political scientists will also be interested. To our knowledge, no such analysis has previously been made. Haxey[2] traced some family and business connections of Conservative M.P.s, but this was to support a political argument. Bloomfield made a study of certain aristocratic and middle class families.[3] But neither of these was part of a scientific investigation. To us, as sociologists, and as members of a Department of Social Anthropology, it was a natural first step to enquire whether the persons whose names appeared in the Tribunal evidence were linked to each other by relationships of friendship, kinship, affinity, common membership of associations, and so on. And the descriptions of behaviour given by witnesses in evidence revealed that some persons were so related. Reference to published sources revealed many more such relationships.

[1]The term 'top decision makers' is used as a makeshift. We are aware that not all the persons we consider are of equal prestige and authority. There are difficult problems of definition raised by this kind of investigation but we think it wise to postpone consideration of these. We shall presently state whom we have included in the category of 'top decision makers' for the purpose of this paper.

[2]Haxey, S. *Tory M.P.*, London: Victor Gollancz (1940).

[3]Bloomfield, Paul. *Uncommon People, a Study of England's Elite*, London: Hamish Hamilton (1955).

In attempting to interpret the behaviour they observe, sociologists look first at these "networks" of relationships, and at the kind of training people receive to occupy positions within them. It seemed to us likely that there would be a "structural" explanation for some of the behaviour described by witnesses at the Tribunal. This article is an attempt to map out some parts of the social structure of "top decision makers".

II

Bagehot wrote:

> " . . . all 'city' people make their money by investments, for which there are often good argumentative reasons, but they would hardly ever be able, if required before a Parliamentary committee, to state these reasons".[1]

The statements from several witnesses at the Parker Tribunal justified this forecast. At one point, after varying attempts to explain how Lazard's came to a decision to sell gilt-edged securities, Lord Kindersley interrupted counsel to say:

> " I have had a feeling—I have been here listening to the evidence in the last day or two—that there is some lack of understanding as to the way my firm works".[2]

The evidence of Lord Kindersley and others revealed that some important decisions were taken and others accepted because colleagues knew about, and relied upon, each other's beliefs and special aptitudes. Lengthy analyses were not a necessary prelude to decision making. This is not surprising. When decisions have to be made quickly most persons have to act according to precedent and "hunch" and not in the light of detailed analysis of the current situation. The consequences of this process for economic decisions such as those which were described by Tribunal witnesses are the concern of the economist. As sociologists we were particularly interested *inter alia* in the influence of custom and precedent in defining roles and activities in the decision-making process. That influences of this kind were at work was indicated by persons appearing before the Tribunal. In his opening speech,

[1]Bagehot, Walter. *Lombard Street*, London: Kegan Paul, Trubner and Co. (1892).

[2]*Proceedings of the Tribunal appointed to inquire into allegations that information about the raising of the Bank Rate was improperly disclosed.* London: H.M.S.O. (1957), p. 187: Q.7326.

the Attorney General, Sir Reginald Manningham-Buller, referred to "the time-honoured fashion" of announcing changes in the Bank Rate. He also stated that:

> "It would be a great departure from precedent and custom if the Chancellor of the Exchequer were to announce a change in the Bank Rate."[1]

When the Governor of the Bank of England, Mr. Cameron Fromanteel Cobbold, was examined by the Attorney General, he explained his "normal practice" when considering "a specific proposal". He said that, depending upon the nature of the proposal, he would consult others in addition to the "recognised sub-committee of the Court for that purpose".[2]

In addition to the influence of custom and precedent in decision making, informality in relationships between decision makers came out clearly in the evidence. A good example of this came out during the examination of Lord Kindersley by the Attorney General. The Attorney General was asking Lord Kindersley why he, and not Mr. Cobbold, had gone to see Lord Bicester about the possible effect of the Bank Rate rise on the Vickers issue and on relations between the "city" and the Bank of England. Lord Kindersley replied:

> "I consider it perfectly natural that I should be allowed to go and talk to a colleague on the Bank of England . . . I do not think that Lord Bicester would find it in the least surprising that I should come to him and say to him: 'Look here, Rufie, is it too late to stop this business or not?' ";

and:

> "I have discussed this with Jim—with the Governor and I am coming on to see you".[3]

The same kind of informality was seen in the activities of directors of some City merchant houses as described before the Tribunal.[4]

The basis of informality in social relationships is often a shared social background, which promotes shared beliefs and confidence in customary procedures. It was this evidence of

[1] *Proceedings*, p. 6.

[2] *Proceedings*, p. 198: Q. 7733.

[3] *Proceedings*, p. 191: Q. 7459 and 7462.

[4] See, for example, the evidence of the Keswick brothers. *Proceedings*, pp. 94, 100, 103, 108.

informality and custom which led us to look for common social background, and links between persons other than those arising from the formal needs of business life. There were pointers in the evidence itself and elsewhere that we might find connections of kinship and of affinity.[1] Ties of friendship and common interest were revealed by the description of a shooting party at which members of the Keswick family were joined by Mr. Nigel Birch and others; and by the meetings of Messrs. J. M. Stevens and D. McLachlan.[2]

Since it was clear that many of the "top decision makers" whom the evidence mentions were interlinked in sets of relationships other than those directly arising out of business arrangements, we wondered whether the same kind of affiliations would be found in a wider sample of such persons, i.e., whether such affiliations tended to be typical of the social milieu of this particular set of "top decision makers". Our choice of a wider sample was influenced by our starting point, and the reader will find that it is biased. But we have included enough persons to make our findings of some sociological, if not statistical, significance.

III

The following are the six categories of "top decision makers" we have chosen to study:

(A) Cabinet Ministers and other Ministers of the Crown;
(B) Senior Civil Servants;
(C) Directors of the Bank of England;
(D) Directors of the "Big Five" banks;
(E) Directors of "City" firms;
(F) Directors of insurance companies.

Category (A) includes all the persons named.[3] Category (B)

[1]Intermarriage amongst banking families has often been referred to. See for example:
Presswell, L. S. *Country Banking in the Industrial Revolution*, Oxford: The University Press (1956);
Truptil, R. J. *British Banks and the London Money Market*, London: Jonathon Cape (1936), p. 262;
Clay, H. *Lord Norman*, London: Macmillan (1957);
Adlard, E. (Ed.), *Robert Holland Martin*, London: Frederick Muller (1947), p. 18.

[2]See the evidence of Mr. J. M. Stevens—*Proceedings*, p. 222; and Mr. D. McLachlan—*Proceedings*, pp. 16 and 17.

[3]*Her Majesty's Ministers and Heads of Public Departments* London: H.M.S.O., No. 60 (July 1958.)

includes the twelve senior members of the Treasury Staff and the Permanent Secretaries and their immediate deputies of twenty-one other ministries. Category (C) includes all directors of the Bank of England (as listed by Mr. Cobbold before the Tribunal). Category (D) comprises all directors of the "Big Five". Category (E) includes the directors of fourteen merchant banks or discount houses, several of which were mentioned before the Tribunal. Some of these are private banks, others public companies, but all have an authorised capital of £2m. or more. We have taken the directors of only eight insurance companies, all with an authorised capital of over £3m., to make up category (F). The selection of these eight out of all insurance companies with authorised capital of over £3m. was not entirely random.[1] We made sure that the two large companies mentioned in the evidence were included. The analysis of the education, club membership, and connections of kinship and affinity, is based entirely on published data.[2]

Table 1 summarises the data on schools attended by members of the six categories. We have lumped together under the heading of "other public and grammar schools" a large number of schools of diverse size and character. No single one of them had educated enough of the persons in our categories to justify being named separately. The Table shows that between one-quarter and one-third of the persons in each category except category (B) went to Eton College. Two-thirds of the Bank of England directors and a half of the Ministers went to the six named public schools, and in all categories except (B) nearly half were educated at these schools. Only three persons from all categories attended State elementary school only. The data on school education shows that the majority of persons in all categories shared the same kind of school education, with the exception of category (B).[3] We have not attempted to make

[1]The main reference was *The Stock Exchange Year Book, Vol. 1, 1958*, London: Thomas Skinner and Co. (Publishers) Ltd.

[2]*Who's Who 1958*, London: Adam and Charles Black.
Burke's Landed Gentry 1952, London: Burke's Peerage Ltd;
Burke's Peerage, Baronetage, and Knightage 1956, London: Burke's Peerage Ltd.;
Debrett's Peerage, Baronetage, Knightage, and Companionage 1957. London: Odham's Press Ltd.

[3]It is interesting that category (B) is the only one of the six to which entrance is by competitive examination.

anything of the totals in the right-hand column since they are distorted by the fact that many persons are members of more than one category and this applies especially to categories (C), (D), (E), and (F). We have 529 names, but not 529 persons.

This last remark applies also to Table 2 which summarises the information on College and University education. A feature of Table 2 is the predominance of Oxford and Cambridge. Over 70% of all Ministers went either to Oxford or Cambridge, and nearly 70% of all senior civil servants, 50% of Bank of England Directors, 50% of directors of the "Big Five". The financial categories (C), (D), (E) and (F) show the greatest proportion of persons with no university education.[1] It will be noted that in Table 2, as in Table 1, large numbers of category (D), (E) and (F) members are to be found under "no data". If our information were complete the picture might possibly be significantly different. Like Table 1, Table 2 shows that, for those persons in our six categories for which we have data, the majority shared the same kind of post-school education, although there are some differences in this regard between the first three and the last three categories. Similarity of educational background forms a link between many members of our six categories both within categories and across their boundaries. And there are also many shared directorships in the last four categories.

The only systematic information we have been able to collect about the leisure time activities of members of this sample concerned club affiliations. This is summarised in Table 3. Table 3 is less complete than Tables 1 and 2 because club membership was not always listed in the references we used. But many persons are members of more than one club. The totals at the bottom of the Table represent a count of all the clubs listed in published sources. Below this in brackets is given the number of persons for whom information was available, and the number of persons in the category. The clubs named in the list are those most frequently mentioned. Others have been counted under headings such as "sports clubs (various)" which includes polo, fishing and golf clubs. Yacht clubs, have been named separately, and also the M.C.C. The various University clubs have been

[1]Reflecting perhaps a tendency for persons to enter banking and finance as young men, and to forego a university education.

collected under one heading, and so have the various Services clubs, with the exception of the Guards and Cavalry clubs; these are separately named. A striking feature of the Table is that the Civil Servants' club membership is confined largely to the Reform Club and to University clubs. There are few members of the other categories in these clubs. Amongst the other categories the clubs most frequently represented are the Carlton, Brooks's, White's, and the Athenæum. The information we have shows that none of the Senior Civil Servants in category (B) belong to the Carlton club, or White's.[1] Again, in Table 3, a good number of the members of our six categories are shown to be linked by the sharing of a common activity, in this case club membership.

TABLE 1

SCHOOLS

	CATEGORY						
	A	B	C	D	E	F	TOTAL
Eton	11 (32·4%)	3 (4·1%)	6 (33·3%)	44 (29·7%)	35 (32·7%)	46 (30·9%)	145
Winchester ...	3	3	2	9	4	7	28
Harrow	1	1	0	8	4	7	21
Rugby	0	5	2	3	2	4	16
Charterhouse ...	0	1	0	4	0	6	11
Marlborough ...	2	1	2	3	1	0	9
Total	**17** (50%)	**14** (19·2%)	**12** (66·6%)	**71** (48%)	**46** (43%)	**70** (47%)	**230**
Other Public and Grammar Schools	15	54	4	53	13	26	165
State Elementary School only ...	1	0	1	1	0	0	3
No data	1	5	1	23	48	53	131
Total	**34**	**73**	**18**	**148**	**107**	**149**	**529**

[1] We do not know how to assess the relative prestige or exclusiveness of the various clubs, but it is probable that the traditional impartiality of the Civil Service precludes its members from joining the Carlton, a club so clearly associated with one political party. Petrie says: ". . . the great names in the Tory hierarchy down the centuries have always been found, and are still to be found, in the list of members of the Carlton." (*The Carlton Club*, London: Eyre and Spottiswoode (1955), p. 15.)

TABLE II

COLLEGE AND UNIVERSITY

	CATEGORY						
	A	B	C	D	E	F	TOTAL
Oxford	18	30	2	46	24	30	150
Cambridge ...	7	20	7	28	13	27	102
Total	25 (71·5%)	50 (68·5%)	9 (50%)	74 (50%)	37 (34·6%)	57 (38·3%)	252
London	2	5	0	1	1	2	11
Other Universities	1	10	2	10	2	8	33
Sandhurst	1	0	1	5	3	6	16
Dartmouth ...	1	0	0	1	1	5	8
Woolwich	0	0	0	1	1	1	3
None	4	9	7	36	13	21	90
No data	1	3	1	23	51	55	134
Total	**35**	**77**	**20**	**151**	**109**	**155**	**547**
No. in category ...	34	73	18	148	107	149	529

TABLE III

CLUB MEMBERSHIP

	A	B	C	D	E	F
Athenæum	4	8	2	14	4	8
Bath	0	2	1	11	4	6
Beefsteak	2	0	1	3	5	8
Boodle's	0	2	1	4	2	8
Brooks's	4	4	2	24	11	20
Buck's	2	0	0	3	3	8
Carlton	18	0	1	23	8	16
Cavalry	0	0	1	5	4	4
City of London ...	0	0	1	13	8	5
Guards	0	0	1	5	1	3
M.C.C.	2	1	1	8	5	20
New (Edinburgh) ...	2	1	0	4	3	3
Oriental	0	0	1	6	3	2
Pratt's	5	1	0	7	4	5
Reform	1	15	0	6	0	2
Services (various) ...	2	1	0	5	3	5
Sports (various) ...	1	4	0	11	1	18
St. James's	0	3	1	5	0	4
Traveller's	0	3	0	7	2	8
Turf	5	1	2	6	7	11
University (various) ...	0	15	2	6	0	3
White's	6	0	2	13	13	23
Yacht clubs	3	2	1	20	5	8
Other clubs	11	22	3	67	5	28
Total clubs ...	**68**	**85**	**24**	**276**	**101**	**226**
Number for whom data was collected ...	(31)	(63)	(14)	(119)	(53)	(90)
Number in category ...	(34)	(73)	(18)	(148)	(107)	(149)

IV.

The evidence we shall assemble in this section is of a different order to that we have so far studied, and we shall say something to introduce it. It might occur to some readers that the most important feature of the diagrams we present below is the recurrence of certain long established family names, and they might wish to read significance into this in the light of other knowledge and interests, or of preconceived ideas. Others might argue that the diagrams mean nothing because they do not include certain prominent families, or because they are incomplete and biased; and so on. That is why we want to make it clear at the outset that, for this analysis, the diagrams are only intended to show the connections of kinship and affinity of some persons who are members of our six categories of decision makers. We used the following procedure: we began by taking persons who were prominent in the Tribunal proceedings, for example Lord Kindersley and Mr. Cameron Cobbold. We traced the names of parents, siblings, spouses and children, and constructed a small "family tree". By following up the names of paternal and maternal kin it often proved possible to join the "family trees," together into a kinship diagram.[1]

We have not been able to trace the kinship connections of all persons in the six categories; and it is only possible to present a limited amount of the material so far gathered. To include all connections of kinship and affinity for even a few dozen people would clearly require a great deal of space and demand greater resources of time and personnel than those available. There may be no kin connections between a great many of the people we have selected; and there are persons represented on the diagrams who belong to none of the six categories. This has partly arisen because we had already the kin and affinal connections of some people referred to at the Tribunal before we extended the scope of enquiry.

For ease of exposition the material is presented in a series of small abridged diagrams. The names of some persons who link one diagram with another are enclosed in heavy black rec-

[1] Properly speaking, a diagram of both kinship and affinity. Triangles represent males, and circles females. Unshaded signs represent living people. The equals sign signifies a marriage connection and the asterisk, a former marriage connection.

tangles with numbers of linked diagrams in small circles attached. Persons who are members of one or more of the six categories have the appropriate group letter or letters below their names.[1] The names of some persons who are directors of other concerns, industrial or financial and commercial, are indicated, where appropriate, with the letters "G" and "H".[2]

We now trace some of the connections illustrated, indicating links between diagrams, links which would make one chart in reality. It would take too long to trace every connection on all the diagrams; the reader is invited to complete this task for himself.

Diagram 1 shows some of the connections of Mr. C. F. Cobbold, Governor of the Bank of England and a member of a family of landed gentry. He is related on his father's side to the late Lt. Col. John Cobbold, who married a daughter of the 9th Duke of Devonshire. Lt. Col. Cobbold's sister married Sir Charles Hambro, a Director of the Bank of England. Lt. Col. H. E. Hambro, married the widow of the 5th Earl of Cadogan, whose grandson married a daughter of Lt. Col. Cobbold (*see* diagram 9.)

Diagram 2 traces links established by the marriage of Sir Everard Hambro with a relative of Lord Norman, who was formerly Governor of the Bank of England. A cousin of Lord Norman married an uncle of the present Home Secretary, the Rt. Hon. R. A. Butler. A daughter of this marriage married Sir George Abell, a Director of the Bank of England, whose brother-in-law, Mr. Nicholas Norman Butler, married into the Hambro family.

Diagram 3 illustrates the marriages of other daughters of the 9th Duke of Devonshire, among them that of Lady Dorothy, wife of the Prime Minister and sister-in-law to Lt. Col. John Cobbold. One of her cousins (father's brother's daughter) married the 28th Earl of Crawford, whose son, Lord Balniel, is Parliamentary Private Secretary to the Minister of Housing and Local Government (late P.P.S. to the Financial Secretary to the Treasury). The Earl is brother-in-law to the Attorney-General

[1] For reasons of space we have had to shorten some names and titles; we trust no one will take offence at this.

[2] The source used for this information was *The Directory of Directors, 1958*, London: Thomas Skinner & Co. (Publishers) Ltd.

(*see* diagram 15), and also to the Marquess of Salisbury. This name takes us to the next diagram—No. 4—which shows marriages of sons of Lord Eustace Cecil. One son married a daughter of the 10th Duke of Leeds, father-in-law of Lord Chandos, Chairman of A.E.I. (*see* diagram 12). Another son was Baron Rockley; his son, the present Baron, and Mr. M. J. Babington Smith (a Director of the Bank of England and of A.E.I.) married daughters of Admiral Hon. Sir Hubert Meade Fetherstonhaugh, who is connected by marriage to the Glyn banking family (*see* diagram 21).

The 4th Marquess of Salisbury connects diagrams 4 and 5. His daughter, sister of the present Marquess, married Baron Harlech, the father of the Minister of State for Foreign Affairs, and father-in-law of the Prime Minister's son. Diagram 5 also connects with diagram 1, through the late Lt. Col. John Cobbold; he was related on his mother's side to the 7th Earl of Dunmore, whose grand-daughter married Mr. D. A. Stirling, a "Big Five" director. Her brother, the late Viscount Fincastle, brings us to diagram 7. He married a daughter of the 2nd Baron Wyfold; another daughter is married to a son of Sir George Schuster, the brother-in-law of the Chairman of the Tribunal, Lord Chief Justice Parker.

Diagram 6 traces some of the connections of the Prime Minister's nephew by marriage, the 11th Duke of Devonshire, a brother-in-law of the writer Nancy Mitford; she married a son of Lord Rennell. Lord Rennell's wife is a sister of Lord Bicester, a senior director of Morgan Grenfell and Co. and a Director of the Bank of England. Lord Bicester, a witness at the Tribunal, was the "Rufie" mentioned in the evidence. Lord Rennell links diagrams 6 and 22, for one of Nancy Mitford's sisters was married to Lord Moyne, grandson of the 1st Earl of Iveagh. Diagram 16 shows that Lord Rennell is also connected to the Keswick family by the marriage of his sister to a brother-in-law of J. H. Keswick. Mr. W. J. Keswick, Director of the Bank of England, is related through his wife to Lord Lovat, brother-in-law of two Conservative Members of Parliament.

Diagrams 8 and 10 are joined by the name of the wife of Mr. M. R. Hely-Hutchinson, whose brother is father-in-law to Mr. J. M. Stevens, a Director of the Bank of England, who gave

evidence at the Tribunal. Her father's family was linked by marriage to Baron Ashcombe, whose brother married a niece of Lord Norman. (Her later marriage is shown on Diagram 19.) Baron Norman's brother's wife was a daughter of the 4th Earl of Bradford, whose grandson, the 6th Earl, is a Crown Estate Commissioner. Another daughter of the Earl of Bradford married the 7th Duke of Buccleuch, brother-in-law to the 3rd Viscount Hampden. Viscount Hampden's son (now the 4th Viscount), managing director of Lazard's, was also a witness at the Tribunal.

The name of Viscount Hampden links diagrams 14 and 15, for the 1st Viscount's daughter was mother to Mr. J. H. Bevan, brother-in-law of Earl Alexander of Tunis. Earl Alexander married a daughter of the 5th Earl of Lucan, whose wife was a daughter of Mr. J. Spender Clay. This brings us back to diagrams 11 and 12, by-passed in the previous paragraph. A son of Mr. J. Spender Clay married a daughter of the 1st Viscount Astor. Diagram 11 shows the Astor-Devonshire link; diagram 12 shows that the grand-daughter of Mr. J. Spender Clay, married the Hon. David Bowes-Lyon, and traces some other marriage connections of members of his family. A daughter of the Hon. Malcolm Bowes-Lyon married a son of the 13th Duke of Hamilton; another son is First Lord of the Admiralty. The 14th Duke is Lord Steward of the Queen's Household.

Mr. H. C. B. Mynors, Deputy Governor of the Bank of England and witness at the Tribunal, is descended on his mother's side from a sister of Mr. J. Spender Clay (*see* diagram 17). His brother, and the Earl of Home, Minister of State for Commonwealth Relations, married sisters, members of the Lyttleton family. The Earl's brother, William Douglas Home, son-in-law of the 4th Viscount Hampden, links this diagram with diagram 14. Further Lyttleton connections are shown on diagram 18. The son of Lord Chandos (Oliver Lyttleton) married a daughter of Sir Alan Lascelles (diagram 4), brother-in-law of the 1st Baron Lloyd. The first wife of Lord Chandos' father was a member of the Tennant family, also referred to in the last diagram. This repeats the name of the late Mr. R. H. Benson. One of his sons married a daughter of the 2nd Earl of Dudley (diagram 21). The Earl's sister married the 4th Baron Wolverton and a daughter of this marriage became the wife of Mr. Nigel Birch, M.P. He

was Economic Secretary to the Treasury at the time of the decision to raise the Bank Rate and also a member of the Keswick shooting party mentioned in the evidence, a party which also included a member of the Hambro Bank family.[1] Diagram 21 also shows two other members of the Government, the Secretary of State for Air, brother of the 3rd Earl of Dudley, and the Earl of Gosford, Parliamentary Under-Secretary of State to the Foreign Office. Their two families are linked by a marriage in the previous generation.

The next diagram (22) introduces Lord Kindersley, Director of the Bank of England and a prominent Tribunal witness. His brother married a niece of the 2nd Earl of Iveagh, father-in-law of the Rt. Hon. Alan Lennox-Boyd, M.P., Minister of State for Colonial Affairs. The Earl of Iveagh is father-in-law to a sister of another Conservative Minister, the Rt. Hon. John Hare, M.P., whose wife is sister to Viscount Cowdray, who was mentioned in evidence at the Tribunal in connection with the Pearson Group of Companies.[2] These connections are shown on diagram 23. The final diagram refers to some further connections of Lord Kindersley.

Some of the diagrams, for example diagram 9, have not been referred to in the text. To have traced all the ramifications of kinship and affinity through all the diagrams would have been confusing, and would have obscured our main aim, that of tracing links between members of the six categories.

Seventy-three of the persons in the six categories appear in the kinship diagrams. We know that there could have been more had not the diagrams been abridged. 8 Ministers are included in the diagrams; and 3 Senior Civil Servants. For the other four categories there are more names than persons, since there are multiple directorships. 9 of the category C names appear, 25 of the category D names, 20 of the category E names, and 32 of the category F names. The only category to be markedly under-represented in the diagrams is category B (top Civil Servants) with only 3 included of a total of 73 in the category. This may arise partly from the method used in compiling the diagrams.

[1]*Proceedings*, p. 98: Q. 3705 ff.

[2]*Proceedings*, p. 32: Q. 926; p. 33; Q. 946-9; p. 130; Q. 4886ff.

Some estimate of the extent of multiple directorships may be gained if the number of names on the diagrams in categories C. D. E. and F is compared with the number of persons: 86 as compared with 62. Finally, in comment on the diagrams, only about 18% of all the names in the categories appear in the diagrams. On the hypothesis that all persons in the categories are linked by kinship or affinity (one to which we do not subscribe) it would take a great deal more research to include them in a series of diagrams.

IV

So far in this article we have presented facts baldly without attempting to assess their meaning and significance. It would have been unwise to have done so in view of the bias of the sample and the incompleteness of the data. Our study must be regarded, then, mainly as a contribution to the "ethnography" of finance, politics, and administration. But we cannot conclude without attempting briefly to relate what we have said to one aspect of social structure which is of particular interest to us.

We have referred to the tradition of intermarriage between banking families. Also by tradition, some merchant bankers become directors of the Bank of England. It is not surprising then that the kinship diagrams show connections between directors of merchant banks, and between merchant banks and directors of the Bank of England. Nor is it surprising that we find that positions in certain firms are occupied by adjacent generations of the same family. The positions of chairman of Lazard Bros. and director of the Bank of England, for example, are now occupied by Lord Kindersley and were once occupied by his father.

What might seem surprising is that kinship connections of this kind have persisted through many changes in the scale and functions of banking, in the organisation of industry, and in the complexity of politics. Bagehot,[1] referring to the family basis of private banking at the end of last century, argued that it was inappropriate for modern large scale organisation. Weber has also argued that bureaucratic, "civil-service-type" structure, in which recruitment and promotion are based on specific technical

[1]Bagehot, op. cit., p. 272 ff.

qualifications, and in which authority vests in the office and not in the person, is the most appropriate to modern conditions, while traditional structures are unsuitable from the point of view of effectiveness. But Weber also argues that, for effectiveness' sake, decision making and execution ought to be separate. And he notes that: ". . . administrative structures based on different principles intersect with bureaucratic organisation."[1]

Some of the organisations to which we have referred seem to have the separation of decision making and executive functions to which Weber refers. Possibly they incorporate both traditionalistic and bureaucratic structure. They have both directors and the managers, generally different sets of persons, possibly of different social background and training. While there have been studies of the influence of kinship as a mode of succession amongst managers,[2] we are not aware of any study which has extended to boards of directors.

Weber's point about the intersection of different structural principles has not been followed up by empirical research in the area covered in this article. Gouldner's examination of some hypotheses derived from Weber in the light of facts about factory social structure could be taken as a model for such work.[3]

The intersection of different social principles has another, individual aspect, that of role conflict. Our evidence shows that many people occupy several social roles. For example, a person may have one role in a kinship system, be a member of one or more boards of directors, and a member of various clubs and associations.

The evidence at the Parker Tribunal referred in many places to this problem, but especially as it related to the dual roles of director of a merchant bank and of the Bank of England, which were occupied by Lord Kindersley and Mr. W. J. Keswick. Commenting generally on this kind of problem, Mr. Cobbold addressed the Parker Tribunal as follows:

[1]Gerth, H. M. and Wright Mills, C. (trans. and ed), *From Max Weber, Essays in Sociology*, London: Kegan Paul (1947).

[2]Clements, R. *Managers—a study of their careers in Industry*, London: Allen and Unwin (1958).
Stewart, Rosemary, *et al.* *Management Succession*, London: Acton Soc. Trust (1958).

[3]Gouldner, A. W. *Patterns of Industrial Bureaucracy*, London: Routledge and Kegan Paul (1955).

> "It seems to me that a similar position often arises both in business matters and, more generally, in other walks of life, where an honest man must often divorce one set of interests from another . . . The position arises almost every day in banking, where a banker is not expected to use, for his bank's profit, secret information about a customer's affairs";

and:

> " . . . the existence of the problem (even if it arises infrequently) must pose the question whether the present arrangement is on balance best suited to the national interest. I am most strongly of the opinion that it is."[1]

Mr. Cobbold seemed aware that there were disadvantages in a situation where individuals were faced, as a consequence of discrepancy between structural principles, with conflicts of loyalty or allegiance. But he was personally convinced that these were outweighed by the advantages. This raises a general problem of comparative social structure. The field we have ourselves surveyed provides extensive data relevant to this problem. These data suggest that "top decision makers" as well as being linked by kinship, business interests and similar background, are also divided by competing, even conflicting interests. Indeed, kinship itself, in certain circumstances, may act as a divisive as well as a uniting force.

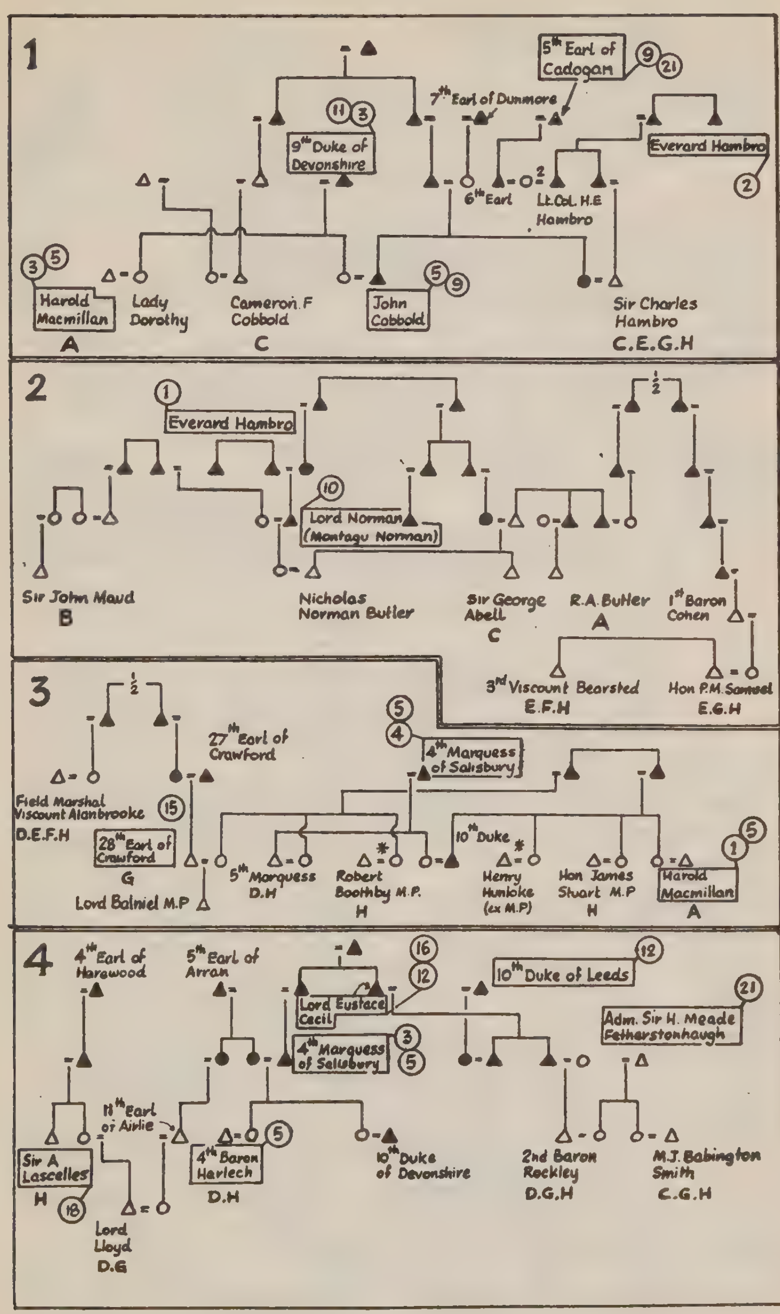
To carry out the research into the problems we have briefly outlined would require investigation of a wider field than we have surveyed, and the use of techniques other than those we have used. Interviews, direct observation of behaviour, complete quantitative analysis of such items as leisure time activities, as well as the construction of complete kinship diagrams would be necessary. This latter technique would close many gaps in knowledge of British social structure. Sociologists, including ourselves, have tended to concentrate on the study of working class groups or small local communities where there is much knowledge of the operation of kinship in social life. For our

[1]*Proceedings*, p. 208.

"top decision makers" we have only biographical material, inspired comment, and little more. It is possible that sociologists have avoided the problem of kinship in "higher circles" because of the formidable problems presented for empirical field research. We can see that there may be many problems of this kind but there is no reason why the published sources of data should not be fully used.

Tom Lupton

University of Manchester. C. Shirley Wilson.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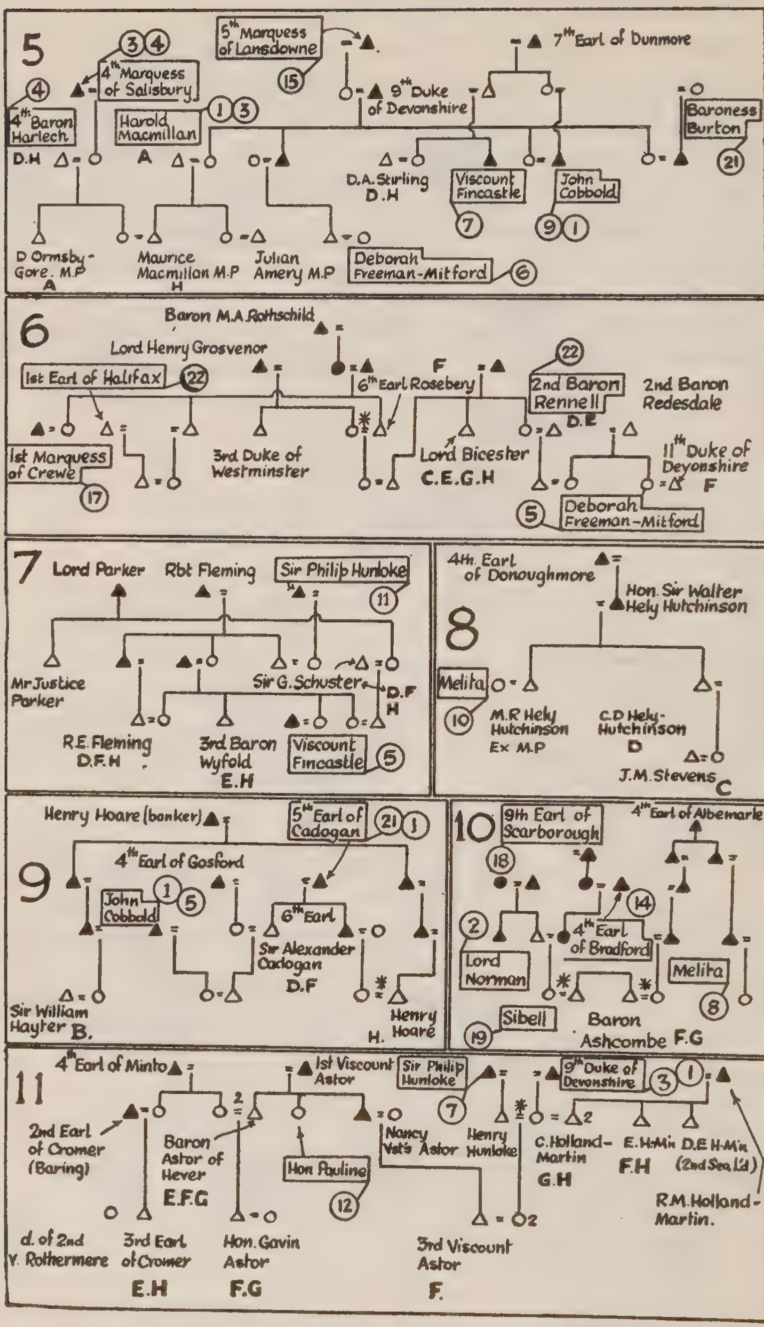
5th Earl of Cadogan
7th Earl of Dunmore
9th Duke of Devonshire
Everard Hambro
6th Earl
Lt.Col. H.E Hambro
Harold Macmillan
A
Lady Dorothy
Cameron F Cobbold
C
John Cobbold
Sir Charles Hambro
C.E.G.H
2
Everard Hambro
Lord Norman (Montagu Norman)
Sir John Maud
B
Nicholas Norman Butler
Sir George Abell
C
R.A. Butler
A
1st Baron Cohen
3rd Viscount Bearsted
E.F.H
Hon P.M. Samuel
E.G.H
3
27th Earl of Crawford
4th Marquess of Salisbury
Field Marshal Viscount Alanbrooke
D.E.F.H
28th Earl of Crawford
G
Lord Balniel M.P
5th Marquess
D.H
Robert Boothby M.P.
H
10th Duke
Henry Hunloke (ex M.P)
Hon James Stuart M.P
H
Harold Macmillan
A
4
4th Earl of Harewood
5th Earl of Arran
Lord Eustace Cecil
4th Marquess of Salisbury
10th Duke of Leeds
Adm. Sir H. Meade Fetherstonhaugh
11th Earl of Airlie
Sir A Lascelles
H
Lord Lloyd
D.G
4th Baron Harlech
D.H
10th Duke of Devonshire
2nd Baron Rockley
D.G.H
M.J. Babington Smith
C.G.H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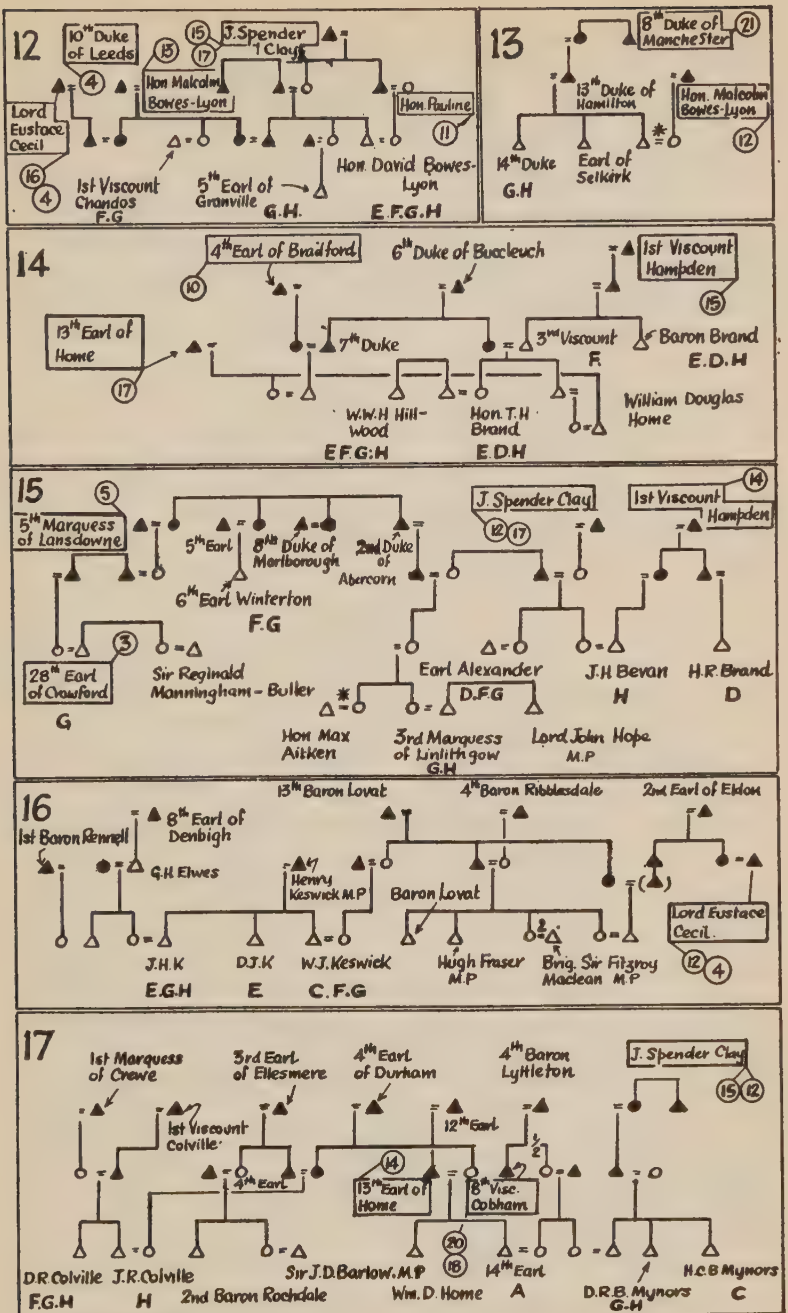
4th Marquess of Salisbury
5th Marquess of Lansdowne
7th Earl of Dunmore
9th Duke of Devonshire
4th Baron Harlech
Harold Macmillan
Baroness Burton
D.H
A
D.A. Stirling D.H
Viscount Fincastle
John Cobbold
D Ormsby-Gore. M.P A
Maurice Macmillan M.P H
Julian Amery M.P
Deborah Freeman-Mitford
6
Baron M.A Rothschild
Lord Henry Grosvenor
1st Earl of Halifax
6th Earl Rosebery
F
2nd Baron Rennell D.E
2nd Baron Redesdale
1st Marquess of Crewe
3rd Duke of Westminster
Lord Bicester C.E.G.H
11th Duke of Devonshire F
Deborah Freeman-Mitford
7
Lord Parker
Rbt Fleming
Sir Philip Hunloke
Mr Justice Parker
Sir G. Schuster D.F H
R.E. Fleming D.F.H
3rd Baron Wyfold E.H
Viscount Fincastle
8
4th Earl of Donoughmore
Hon. Sir Walter Hely Hutchinson
Melita
M.R Hely Hutchinson Ex M.P
C.D Hely-Hutchinson D
J.M. Stevens C
9
Henry Hoare (banker)
5th Earl of Cadogan
4th Earl of Gosford
John Cobbold
6th Earl
Sir Alexander Cadogan D.F
Sir William Hayter B.
H. Henry Hoare
10
9th Earl of Scarborough
4th Earl of Albemarle
4th Earl of Bradford
Lord Norman
Melita
Sibell
Baron Ashcombe F.G
11
4th Earl of Minto
1st Viscount Astor
Sir Philip Hunloke
9th Duke of Devonshire
2nd Earl of Cromer (Baring)
Baron Astor of Hever E.F.G
Hon Pauline
Nancy Vst's Astor
Henry Hunloke
C. Holland-Martin G.H
E. H-M'n F.H
D.E H-M'n (2nd Sea L'd)
R.M. Holland-Martin.
d. of 2nd V. Rothermere
3rd Earl of Cromer E.H
Hon. Gavin Astor F.G
3rd Viscount Astor F.


12
10th Duke of Leeds
4
15 J. Spender Clay
13 17
Hon Malcolm Bowes-Lyon
Hon Pauline
11
Lord Eustace Cecil
16
4
1st Viscount Chandos
F.G
5th Earl of Granville
G.H.
Hon. David Bowes-Lyon
E.F.G.H
13
8th Duke of Manchester
21
13th Duke of Hamilton
Hon. Malcolm Bowes-Lyon
12
14th Duke
G.H
Earl of Selkirk
14
4th Earl of Bradford
10
6th Duke of Buccleuch
1st Viscount Hampden
15
13th Earl of Home
17
7th Duke
3rd Viscount
F
Baron Brand
E.D.H
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Hon. T.H Brand
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5th Earl
8th Duke of Marlborough
2nd Duke of Abercorn
6th Earl Winterton
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J. Spender Clay
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1st Viscount Hampden
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28th Earl of Crawford
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Sir Reginald Manningham-Buller
Earl Alexander
D.F.G
J.H Bevan
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H.R. Brand
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Hon Max Aitken
3rd Marquess of Linlithgow
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Lord John Hope
M.P
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1st Baron Rennell
8th Earl of Denbigh
G.H Elwes
13th Baron Lovat
4th Baron Ribblesdale
2nd Earl of Eldon
Henry Keswick M.P
Baron Lovat
Lord Eustace Cecil
J.H.K
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Hugh Fraser
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Brig. Sir Fitzroy Maclean M.P
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1st Marquess of Crewe
3rd Earl of Ellesmere
4th Earl of Durham
4th Baron Lyttleton
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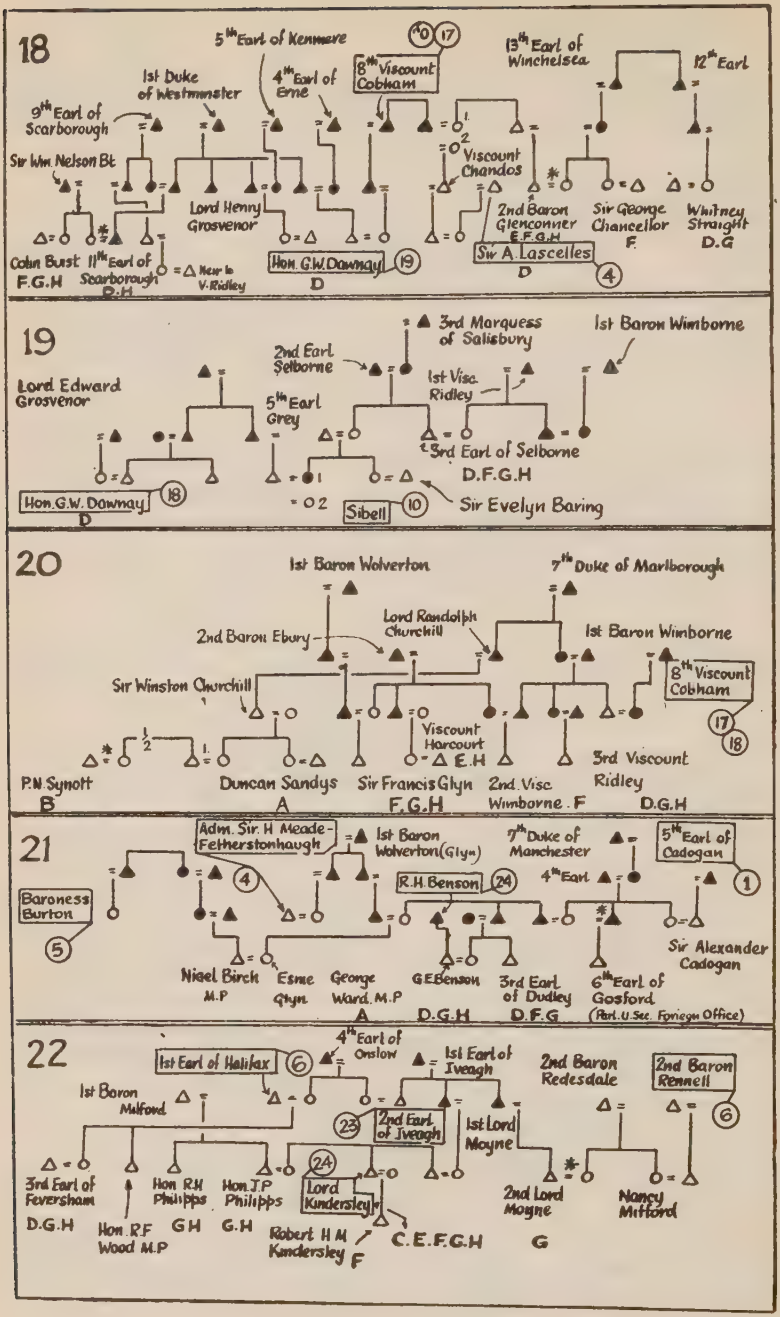
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Viscount Chandos
Lord Henry Grosvenor
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Sir George Chancellor F
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Lord Randolph Churchill
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Duncan Sandys A
Sir Francis Glyn F.G.H
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Adm. Sir H. Meade-Fetherstonhaugh 4
1st Baron Wolverton (Glyn)
7th Duke of Manchester
5th Earl of Cadogan 1
Baroness Burton 5
R.H. Benson 24
4th Earl
Sir Alexander Cadogan
Nigel Birch M.P
Esme Glyn
George Ward. M.P A
G.E. Benson D.G.H
3rd Earl of Dudley D.F.G
6th Earl of Gosford (Parl. U. Sec. Foreign Office)
22
4th Earl of Onslow
1st Earl of Halifax 6
1st Earl of Iveagh
2nd Baron Redesdale
2nd Baron Rennell 6
1st Baron Mulford
2nd Earl of Iveagh 23
1st Lord Moyne
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3rd Earl of Feversham D.G.H
Hon. R.H. Philipps G.H
Hon. J.P. Philipps G.H
Lord Kindersley
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Robert H.M. Kindersley F
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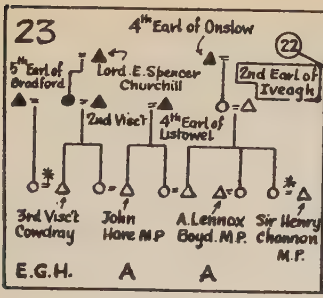
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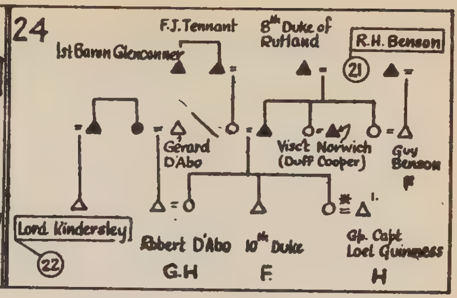
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Gerard D'Abo
Visc't Norwich (Duff Cooper)
Guy Benson
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Lord Kindersley
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Robert D'Abo
10th Duke
Gp. Capt Loel Guinness
G.H
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Competition and the Law

By the time this article is published the first agreements will have appeared before the Restrictive Practices Court to discover whether, under the 1956 Restrictive Trade Practices Act, they are or are not contrary to the "public interest." The results of these, and the other cases in the first batch of agreements, will be crucial for the future of British business. It is no exaggeration to say that this important statute may drastically alter the pattern of restriction and the extent of competition in this country. At this point in the history of "monopoly" legislation it seems useful to survey the development of the legal codes which relate to preventing and restricting competition ; to this end the more important legal decisions of earlier years will be discussed, together with some aspects of the 1948 and 1956 Acts.[1]

I

Prior to 1948 three legal doctrines—"monopoly," "conspiracy" and contracts "in restraint of trade"—regulated the prevention and restriction of competition.[2]

Monopoly in the sense of an arrangement establishing an absolute monopoly excluding from trade all domestic and foreign competition has been for many centuries against the policy of English law. After considerable resistance monopoly

[1]On this commentary on the law references to the operation of the 1956 Act should not be connected in any way with the author's services as economist in the Office of the Registrar of Restrictive Trading Agreements. The material used is available to all in statutes, official publications, press releases, legal authorities, etc. And the views and opinions set out are the expressions of a private, professional interest in no sense reflecting official ideas or policy.

[2]For the legal texts on this and subsequent sections see Dix, *The Law Relating to Competitive Trading* (1938) ; Friedmann, *Law and Social Change in Britain* (1951) ; Martin, *Restrictive Trade Practices and Monopolies* (1957) ; Lloyd, *Public Policy* (1939) ; and Wilberforce, Campbell and Elles, *The Law of Restrictive Trade Practices and Monopolies* (1957).

For economists' commentaries on legislative developments, see Grunfeld and Yamey, *Anti-Trust Laws* (ed. Friedmann, 1957) ; Hunter, "Development of Monopoly Legislation in Britian," *Scottish Journal of Political Economy*, Oct., 1956 and "Control of Monopoly," *Lloyds Bank Review*, Oct., 1956 ; C. Kaysen, *Westminster Bank Review*, Aug., 1956 ; and W. A. Lewis, "The Crofter Case," *Modern Law Review*, 1941.

was rendered void by the Statute of Monopolies (1623) ; and the Bill of Rights finally ended the arbitrary allocation of Crown monopolies. But this doctrine, although in theory still good law, has had little practical importance. The Statute has never interfered with the charters, letters patent customs, etc. of any corporation or fellowship of art, trade or profession, and these remain subject to crown prerogative. It did not touch the patent monopoly of inventors. Nor indeed did Parliament renounce the right to create its own statutory monopolisation of industry. But the more serious defect from the point of view of legislative control concerns the meaning of the word monopoly. It is much too restricted for effective use in the modern economy. The legal content describes a situation in which practically the whole of a trade is held in one set of hands to the exclusion of all competition domestic and foreign ; clearly, monopoly power in a highly industrialised economy trading internationally is rarely as absolute as this. There are always some independents, some substitutable products, some alternative methods of manufacture and nearly always some potential import to restrict the power of the would-be-monopolist. True, the courts have widened the doctrine somewhat by declaring undesirable the "pernicious" monopoly : one "calculated to enhance prices to an unreasonable extent." But the difficulty is to know what is unreasonable here ; and in any case high prices may be the least important of the consequences of a monopoly.

By contrast the doctrine of conspiracy looks a useful instrument for the regulation of certain categories of restrictive practice. In general a conspiracy is an act, otherwise lawful, which becomes unlawful if two or more persons combine to take action with intent to injure ; and the injured party has a remedy through a civil action for damages or an injunction. For example, to place an "independent" on a trade association's stop list, in order to sever certain of his lines of trade, would appear to be injurious in this sense. The use of collective economic power to drive a rival out of business by means of persistant undercutting—even to the extent of suffering temporary losses—looks like wilful damage. And an embargo

on supplies to competitors would seem to be almost certainly a conspiracy on which action could be taken.

In the 18th and early 19th centuries such combinations would undoubtedly have been interpreted as conspiracies at common law ; but towards the latter half of the 19th century the high tide of *laisser-faire* sentiment gave rise to the interpretation, in the words of a legal authority, that such actions "did not pass the line which separated the reasonable and legitimate selfishness of traders from wrong and malicious acts." Thus the public policy developed—now based on the definitive trilogy of the Mogul case (1892), Sorrel and Smith (1925) and the Crofter case (1942)—so that however severe the damage sustained by a third party, as the result of any of the above actions, no liability attaches—unless the person or companies concerned combine wilfully or maliciously to damage. The respondents need only demonstrate that the *predominant* motive of the combination is to protect or promote legitimate trading interests and the case is secure. Indeed it would be most difficult to establish the contrary—that any business action is actuated primarily by malice or pure spite. Further, because the ruling emerged that the motive need only be established as a matter of fact, not law, the development of civil conspiracy as a control over combinations is effectively stopped. The rightness or wrongness of the trade policy of the combination cannot be re-interpreted as a matter of public policy.

The law on contracts in restraint of trade on the other hand remains open for new pronouncement in the light of contemporary social and economic developments ; and it is still, to quote Lord MacMillan, "a doctrine of full force and vitality" whatever its scope at any given time. However, this is probably an over-optimistic view of the situation. The scope of the doctrine has been so eroded by the development of the "reasonableness" tests that effectively, so far as preventions and restrictions of competition are concerned, policy has "evolved from one of suppression up to the 17th century, through partial recognition in the 19th century, to near abstention in the 19th and 20th centuries."

The modern doctrine (laid down by Lord Macnaghten, in the Nordenfelt case of 1892) is that agreements in restraint of trade are void and unenforcible *unless* they can be shown to be (*a*) reasonable between the parties to the agreement and (*b*) reasonable in relation to the public interest. The parties relying on the validity of the agreement must establish the former ; while those contesting the agreement have the task of demonstrating that it is unreasonably harmful to the public interest. *Prima facie*, this is a method of elucidating "reasonableness" which, for individual cases, might well reflect a proper balance between the private, particular interests of business and the more general public interest. But, whereas it is not unduly difficult to discharge the initial duty of proving reasonableness *inter partes*—"the parties are the best judges of what is reasonable between themselves" says a well-known authority—to establish the public interest of a case is apparently impossible. Strange to relate, there is a ruling that evidence of actual or likely economic consequences of an agreement, by trade, technical, or other expert witnesses, is not admissable. As Lord Bramwell said in the *Mogul* case, how can a judge decide that an agreement is against public policy and void "without any evidence as to its effect and consequences?" Thus, by default, private interests were given priority over those of the public. And, in effect, common law authority was conferred upon agreements which provide for level-tendering, buying clauses, exclusive dealing arrangements, market sharing, re-sale price maintenance, etc. ; that is upon all the important contractual arrangements which restrict or prevent competition.

* * *

It is interesting to speculate why two potentially effective legal doctrines—conspiracy and restraint of trade—had become so vitiated by the mid-20th century that completely new legislation was required to control restrictive practices. Throughout the common law on restrictive practices there has always existed a fundamental conflict. There is, on the one hand, freedom of trade for the individual on whatsoever terms he finds to promote his best interests. And, on the other hand,

there is the freedom of contract which implies a freedom to combine with some against others even to the extent of restricting or preventing their freedom to trade. But the law itself offers no decisive reason why one or the other should be favoured. For example, in the early law all contracts in restraint of trade were, in the words of a 19th century judgment, "against public policy in the sense that it was deemed impolitic to enforce them and not because every such contract must necessarily operate to the public injury" : thus, there was a strong presumption in favour of the freedom to trade. But the "reasonableness" tests emerged to modify this strict view and eventually to push the balance of favour to the other extreme. The explanation of these apparently arbitrary swings in the public policy of the law on competition must be sought mainly in extra-legal considerations.

Take for example, the ruling which precluded evidence of an economic character in restraint of trade cases. Partly it had its origins in the narrow technical point that extrinsic evidence is not generally admissible to construe a written contract. But perhaps the more fundamental reason here is that the judicial body did not feel itself competent to evaluate economic evidence. The reasonableness of contracts *inter partes* is a matter which a court can extract at first hand and on a firm foundation of past precedent. By contrast, consideration of the likely economic consequences of a restrictive agreement—in terms of price and profit levels, efficiency, consumer satisfaction, the degree of concentration, etc.—compels judges to be guided by the dicta of witnesses whom the legal profession flatteringly, but also distrustfully, describe as "experts." Understandably, they may have preferred to avoid this contingency.

More positive factors may have been at work too. Victorian England was markedly a business society whose mores were bound to impress themselves on the judicial mind. Moreover, around the turn of the century it was increasingly a big business society—so much so that public concern on cartels and trusts compelled the government of the day to appoint the Committee on Trusts which eventually reported in 1919. In this society judges inevitably had their friends and heroes. It is not

surprising, to quote W. A. Lewis, that "finding themselves called upon to deliver judgments on subjects they were never equipped to understand they threw in their lot with what appeared to them to be the more modern developments." Some went so far as to suggest that monopoly and regulation were probably in the public interest. Thus Lord Haldane (1914) says : "unquestionably the combination in question was one the purpose of which was to regulate supply and keep up prices. But an ill-regulated supply and unremunerative prices may in point of fact be disadvantageous to the public . . . drive manufacturers out of business, lower wages, cause unemployment, etc." Then, unfortunately, the inter-war depression years—in which price-fixing, redundancy agreements and market-sharing flourished—confirmed legal opinion in a policy of non-interference with restrictive contracts.

II

When one considers that the Monopolies and Restrictive Practices Act (1948) was Britain's first legislation since 1623 and was destined to reverse the whole bias of the common law it is surprising how quietly, almost incidentally it seemed, it arrived on the statute book. No vociferous pressure group backed it and no party regarded it as a major item of policy. The war-time Coalition government had indicated a new policy towards monopoly in the famous White Paper on Employment Policy (1944) observing that "there has been a growing tendency towards combines and towards agreements, both national and international, by which manufacturers have sought to control prices and output, to divide markets and fix conditions of sale," and, as part of a policy to maintain full employment, it was promised that the "Government will seek power to inform themselves of the extent and effect of restrictive agreements, the activities of combines—and take appropriate action."

The official reasons for statutes must often raise the eyebrows of social historians. The problem of combines and trusts in Britain had been pointed out by economists half-a-century before ; and the 1930's and 1940's could scarcely be said to mark a turning point in their growth. Then the government itself had been an initiator, even organiser, of various restrictive

schemes in the inter-war years and had practiced a studied ignorance of similar private enterprise activities. Further, there never had been established any satisfactory general connection between the effects of restrictive agreements or combinations and unemployment. At most there was a vague chronological association between the growth of price rings and the onset of depression helped out by a few theoretical speculations (and a modicum of prejudice?). Indeed the evidence, if anything, seems to reverse the alleged cause and effect. That is, restrictive agreements—particularly price-fixing, quota and market-sharing—proliferated out of the depression in order to mitigate the more serious effects of price competition. It was claimed that they permitted more firms to remain in business and thus helped support a larger work-force than might otherwise have been possible. Nowadays, it is well understood that the general level of employment is controlled by such factors as the availability of loanable funds, the flow of investment opportunities, export markets, etc. "The degree of monopoly" as a propagator of unemployment is fast disappearing from economic literature.[1]

Thus, although no one would deny that legislation was overdue the official rubric for the 1948 Act was both pedantic and innaccurate. Probably, reasons characterised by less lofty motives occasioned the bill. On the one hand we have the Labour Party's suspicions of "monopoly capital" and "profiteering" private enterprise, which was largely handed down from 19th century left wing thought and literature and has been modified little since then, and on the other hand the Conservative Party's view, equally vague and held with rather less unanimity, of the merits of free enterprise and competition. Perhaps the factor most responsible for bringing the bill to fruition was the feeling that here is an important—if obscure—idea that must be transferred to the statute book before the other side have a chance.

* * *

[1]Compare, for example, J. K. Galbraith, "Monopoly and Concentration of Economic Power," *Survey of Contemporary Economics* (ed. Ellis) pp. 109-115 and the references therein ; also K. E. Boulding, "In Defense of Monopoly," *The Quarterly Journal of Economics*, Vol. 59, p. 524.

However metaphysical our legislators' knowledge of the subject, in the event, to the credit of all concerned, the 1948 Act displayed a remarkable regard for the facts. First, in establishing as its main instrument the Monopolies and Restrictive Practices Commission the Act set up an extra-judicial body specifically charged with the task of discovering the nature and scope of the problem by means of inquiries into industries and trades. Appointments to the Commission were on a basis of "varied outlook and experience" and included business men, barristers, economists, trade-union officials, accountants, etc. ; all but the chairman on a part-time basis. At first there was a maximum of only ten members. Later under the 1953 amending Act it became possible to appoint twenty-five. A permanent staff of fifty later rising to just over one hundred was provided. The Commission's effectiveness was also enhanced by statutory powers to call witnesses, take evidence on oath, to call for returns or other relevant documents ; and there were appropriate penalties for non-compliance, suppression of documents, etc. Secondly the Act made no attempt to define or condemn monopolies or restrictive practices. Certain minimum conditions (control of one-third of the supply of a good by arrangement or agreement) were laid down before any inquiry could be initiated by the Board of Trade. Otherwise the only guiding element was Section 14 which, in listing all the text-book requirements of a flexible, progressive economy as desirable criteria, created an instruction so general as to give the Commission carte-blanche in its inquiries and recommendations. Thirdly, despite the reference in the title the powers of control were negligible. In making its report the Commission only *recommended* appropriate remedies to the Government and the Government then made a statutory order if it felt so inclined. Thus the control element had a purely *ad hoc* application at official discretion and, in practice, was exercised only once in twenty cases. Informal approaches to industry were preferred. In sum, the bias of the Act was mainly towards fact-finding.

Thus the 1948 Act marked no material development in legal doctrine as such. Its true significance lies in the advances in knowledge made in the course of the Commission's inquiries

to provide the material and stimulus for new legislation. Two types of report were produced. Primarily, the Commission was required to investigate and report on particular cases of monopolistic arrangement or restrictive practice. These industrial case-studies were expected to, and did in fact, yield authoritative analyses on particular practices and industries. In addition, under Section 15, the Commission could be directed to report "on the general effect on the public interest of practices of a specified class." At first sight this section appeared to call from an occasional essay summarising the experience of certain practices. Whether this was the original intention or not the first general report (on agreements to withhold supplies or make them available only on discriminatory terms) gave rise to something different. The report, *Collective Discrimination*, was in effect a major survey of restrictive practices in British industry. Faced with the material and recommendations contained in this report the Government could not avoid bringing legislation into existence to remedy what was now manifestly a fundamental need. The 1956 Restrictive Trade Practices Act was the result.

III

The legislators were bound to be influenced by the views expressed in the *Collective Discrimination* report. A majority group of seven in the Commission held that the practices they had examined "operate generally against the public interest" and existed in a large number of trades. They recommended a general statutory prohibition (giving provision for exemption on only a few closely specified grounds) involving the creation of a new category of criminal law. This course of action "would give industry clear and unequivocal guidance as to the government's policy and avoid the uncertainty and waste involved in detailed inquiries in each individual case." The minority of three were not prepared to go so far. While agreeing that the practices normally operated against the public interest they maintained that the evidence received for this report did not justify so sweeping a condemnation for all cases : general prohibition would lead to injustices. Instead they proposed a registration system which "would form the basis for the selection

of agreements and for the detailed examination of their operation."

From the first it was clear that the Government itself was against employing "the stigma of the criminal law." On the other hand it could not ignore the criticism that re-examination of the practices case by case would be a slow and cumbersome affair and repeat to a large extent work already done by the Monopolies Commission. Nor could it neglect the fact that the judicial tradition of independence and objectivity, and the publicity of the law courts, would carry more weight in the world of business than would a tribunal of administrative calibre. Eventually the Restrictive Trade Practices Act emerged in 1956 a unique compromise of the two points of view —although clearly more influenced by the minority rather than the majority recommendations. Registration of restrictive agreements and arrangements, going well beyond the scope of the *Collective Discrimination* report and including such practices as price-fixing for example, is the first stage of the procedure. In the second stage all agreements are challenged by an independent government agent, the Registrar of Restrictive Trading Agreements, before a new "superior court of record," the Restrictive Practices Court. The sittings of this Court normally will be composed of one judge together with two lay members "qualified by virtue of their knowledge of or experience in industry, commerce or public affairs." The presumption of the Act is that all registerable agreements operate against the public interest. But there are exemptions. And the task of the Court is relatively restricted : to decide, from the facts placed before it in the pleadings of the Registrar and the respondents, whether or not an agreement escapes the presumption by coming within the circumstances of one or more of the seven exemption clauses of Section 21 of the Act.

Hence the Government may have secured the best of both worlds ; there is no outright prohibition of restrictive practices enforcable by criminal law ; that particular political hazard is avoided. Instead there is a form of review to examine the nature and effects of all practices which are registerable as

restrictions and to determine their future legal standing.[1] And for the reviewing functions, normally the work of an administrative tribunal, the Government has secured the services, together with the independence, authority and dignity, of a legal tribunal which carries the standing of a division of the High Court.

* * *

There is also a Part II of the Act under which it now becomes unlawful, without recourse to the Restrictive Practices Court, to make any arrangement or agreement calculated to enforce resale price maintenance conditions—by withholding supplies (or orders) or by supplying (or ordering) on discriminatory terms. It is equally unlawful to make, or agree to, any arrangement for the recovery of penalties for breach of resale conditions ; or to conduct any form of domestic tribunal in the same connection. On the other hand Part II also expressly provides that, when goods are sold subject to a resale price condition, the condition may be enforced in the Courts, by the individual manufacturer, against *any* third party who deals in his goods—providing notice of the prescribed prices accompany the goods. The main relief here is an injunction restraining the defendant from further sales in breach of conditions ; the Act also provides for damages and costs. This powerful remedy undoubtedly is the main *quid pro quo* to industry to make Part I of the Act more acceptable.

Finally, there is a Part III which amends the 1948 and 1953 Acts to reconstitute the Monopolies Commission on a smaller

[1]Some confusion has arisen because the Act presumes that *all* registerable agreements operate against the public interest. This, it is represented presumes guilt before any hearing takes place—a reversal of the usual principle of British justice. The correct view of the situation however is this : the intention of the Act is that all agreements unreasonably restrictive shall be void. The principle here is no different from that involved in legislating conditions for hire purchase, dividend stripping, finance acts, etc. The difference lies in a problem of definition—what is reasonable, what is the nature of the public interest ? Hence the main part of the Act is a procedure to determine, through some development of case-law, the boundary between voidable and exempted agreements. Thus the Court is not charged with finding either guilt or innocence ; this can arise only in the event that its decisions are infringed.

basis. It also arranges a division of responsibility for monopolies and restrictive practices by requiring that the Commission will no longer investigate any agreement or arrangement which is registerable and will therefore come before the Restrictive Practices Court. Thus the Commission appears to slip into the background. But this may turn out to be a misleading impression. Its functions, although residual to those covered by the 1956 Act, are significant and may become increasingly so. Three types of situation may now be referred to the Commission for inquiry. First, agreements and arrangements solely concerned with exports. With the growth of international arrangements and free trade areas these may become subject to a supra-national authority ; hence, presumably, their special treatment. Secondly, the situation where one concern or group of related concerns is responsible for at least one-third of the supply of a good—the monopoly or "single-firm" control of an industry. Thirdly, and perhaps most important, the Commission may be required to investigate and recommend on the situation where two or more firms, together responsible for more than one-third of the supply of a good, prevent or restrict competition *otherwise* than by means of a registerable agreement. Thus, "gentlemen's agreements" or understandings between four or five large firms to restrict the extent of their competition by tacitly fixing price-levels, allocation of markets, types of product, etc. will be brought into the legislative net.[1]

IV

The first Part of the 1956 Act is designed to regulate competition in industry and distribution through the control of restrictive practices. It may do no more than modify the pattern of restrictions ; on the other hand it may eliminate them almost completely. How far the Act is likely to go in this direction is the crucial question. The answer turns on two matters ; the comprehensiveness of the registration provisions

[1]Undoubtedly the responsible authorities have this problem of oligopolised industries practicing "conscious parallelism of policy" under review. The Board of Trade annual report on the 1948 and 1953 Acts for 1956 goes out its way to make the point that the 1948 Act can be interpreted to cover such situations.

for agreements ; and the severity of the tests to be used in the judicial investigation of agreements.

Registration clearly brings in a wide range of restrictive practices. Section 6 defines as registerable "any agreement" between two or more persons in the production, supply or processing of goods "under which restrictions are accepted in the following matters" :—

(*a*) The *prices* to be charged quoted or paid for goods supplied, offered, acquired or processed.

(*b*) The *terms or conditions* on which supplied, offered, acquired or processed.

(*c*) The *quantities* or *descriptions of goods* to be produced, supplied or acquired.

(*d*) The *processes of manufacture* to be applied to any goods.

(*e*) The *persons or classes of person* and the *areas or places* to whom or which goods may be supplied or acquired from.

These categories cover, for example, agreements to suppress or possibly regulate the application of a new technical development, agreements to share the trade of a particular area, quota and pooling agreements, trade association arrangements to control the number of new entrants into an industry, level tendering, pre-auction agreements and price-fixes. There are further provisions to bring in aggregated rebates and payments into pooling systems which escape the above. On the other hand a certain group of restrictive arrangements is exempted registration : this includes the various restrictions authorised by statute such as agricultural marketing schemes, restrictions under the Iron and Steel Act, etc., and those covered by the legislation on patents and trade marks. In addition a special exception is made for agreements to conform with "standards of dimensions, design or quality for the time being approved by the British Standards Institution." Finally, restrictions on the supply of services and, more specifically, the supply of labour are excluded from registration requirements. Thus the authority of the Act encompasses manufacturing industry and the supply and distribution of goods but stops short of

transport, commerce, banking, trade unions; a big enough area for a first bite at the problem although some may say the worst is yet to come.

Within the chosen field these categories are undoubtedly comprehensive. But a loophole remains: what precisely constitutes an agreement? Here again there is left little room for legalistic manœuvre. "Agreement" in the Act includes an agreement or *arrangement* to restrict. And arrangement is a legal term undefined here or anywhere else which doubtless increases its value as netter of restrictions. Also, the agreement need not be enforcable, or intended to be such, at law. It need not be in writing; it may be informal, verbal, understood. And it need not be expressed; it may be implied by the nature of the arrangements. A simple obligation is here sufficiently strong to constitute an agreement. A final and unusually severe element in the legal content of agreement is that the *recommendations* of a trade association (express or implied) on any of the categories of restriction mentioned above will lead to the constitution of the association being interpreted as though each member agreed to comply with the recommendation although expressly excluded by association rules from any obligation to comply with recommendations. It would be difficult to conceive of any substantial restriction which can escape so inclusive a set of definitions. Indeed the danger is that many individuals may find themselves on the Register on account of quite harmless recommendations and arrangements. As against this, application to the High Court can succeed in removing an aggrieved person's name. And the Registrar himself, with the sanction of the Board of Trade, would appear to have wide powers to remove agreements "of no substantial economic significance" from the Register.

Equally important are the provisions for enforcing the registration requirements. A statutory obligation falls on all parties to an agreement to communicate with the Registrar and furnish essential particulars. Most agreements will arrive on the Register in this fashion but there is, of course, scope for misunderstanding and, more particularly, evasion of this duty. However the Registrar has further powers. No criminal offence occurs if signatories fail to communicate within the stipulated

period. But if the Registrar "has reasonable cause to believe" that an agreement exists—has for example some volume of complaint from interested parties—he may then take the initiative by giving notice to the persons concerned each to specify whether or not he is a party to a registerable agreement.

The receipt of this notice poses crucial questions for the business man : should he admit knowledge of the agreement and furnish particulars ? Alternatively, should he ignore the notice, represent the agreement as harmless and not liable to registration, arrange to have it quietly dropped, or simply deny its existence ? Given the powers of the Act these latter are hazardous enterprises if, in fact, there is an agreement. In this connection the Registrar can require the persons concerned to appear before the High Court to be examined on oath and produce relevant documents. For a failure to comply with the Registrar's notice "without reasonable excuse" any person may be liable, on summary conviction, to a fine of £100. For making false statements, suppressing or altering relevant documents he is again liable on summary conviction to a £100 fine and/or imprisonment for three months. Alternatively, if the default is serious enough to warrant indictment, he is liable to a fine and/or imprisonment for up to two years. And where the person is a body corporate, the director, manager, secretary or other officer whose connivance or negligence caused or supported the default is also liable to proceedings and may be "punished accordingly." If it is not practicable to proceed against individuals the sanctions may be directed against the operation of the agreement. Positive evidence of default may lead the High Court to order one or more of three things : it may order any party to the agreement to furnish particulars within a set period ; it may authorise the Registrar to use whatever document he possesses and proceed as though these constituted the entire agreement ; and, if satisfied that the default is "wilful," the High Court may make an order restraining the performance of the agreement as though it had been found void before the Restrictive Practices Court. And no appeal is allowed from this order for two years.

These penalties are severe not to say drastic. Whatever else, the draftsmen of the Act were determined to permit no

escape from the salutary publicity of registration. Much indeed was expected of registration. It was hoped seemingly to repeat Swedish experience in which 30 per cent. of the agreements registered over five years were cancelled or modified. So far the reaction to registration as such has not been too encouraging. An unknown but probably small number of agreements were dissolved during the three months grace before registration became compulsory. On the other hand the prospect of uncertainty and expense before the Restrictive Practices Court has discouraged a good proportion of signatories to agreements. Two hundred and fifty agreements have been directed by the Board of Trade for prior attention. Of these one quarter were subsequently abandoned when the Registrar served notices of reference and made it clear he meant business. At this point, evidently, the agreements no longer appeared worth while to the parties concerned. But it is evident that a substantial majority of firms feel that their restrictions are beneficial and will survive judicial examination. A sharply critical line in the first few cases before the new court could yet promote a widespread dissolution of agreements.

* * *

For the judicial investigation the Registrar of Restrictive Trading Agreements has the important task of selecting the order of appearance of agreements and initiating proceedings before the Court. He is not on account of this to be regarded as a public prosecutor in the usual sense. He is independent of the law officers of the Crown ; and, as he has stated, it is part of his duty to present all relevant evidence, adverse or favourable, for any given agreement. In most cases, however, he need not be too objective. Firms and trade associations may be expected to have an intimate knowledge of the essential points in favour of an agreement and will, normally, safeguard their interests by employing solicitors and counsel to present their case effectively to the Court. On the other hand the Act requires that considerable factual knowledge of the detriment to the public, "being purchasers, consumers or users," resulting from the operation of the restriction be made known to the Court—thus rectifying a major defect of public policy under

Common Law doctrines. But evidence of this type is not easily discovered ; and the Registrar's staff may well find that the major part of their task is its collection and preparation. Therefore, as in most judicial procedure, an appropriate division of labour will probably evolve ; and the Registrar will come to function mainly as guardian of the public interest.

In the actual hearing Section 21 of the Act instructs the Court. It requires that "a restriction accepted in pursuance of any agreement shall be deemed to be contrary to the public interest . . . " That is, the presumption is that all registerable agreements shall be rendered void. But in the further phrase " . . . unless the Court is satisfied of any one or more of the following circumstances" the Act goes on to state the grounds for exemption. They are broadly as follows : (*a*) that the restriction is necessary to protect the public against injury ; (*b*) the removal of the restriction would deny to the public "other specific and substantial benefits or advantages" ; (*c*) the restriction counteracts the monopolistic or restrictive practices of others ; (*d*) the restriction is necessary to enable the signatories to negotiate fair terms with strong buyers or sellers ; (*e*) the removal of the restriction would lead to "serious and persistent" regional unemployment or (*f*) substantially reduced export earnings ; (*g*) the restriction is one necessary for the support of other restrictions already found to be in the public interest. And finally, in the event that any such grounds are established, a "tailpiece" to Section 21 requires the Court then to be "further satisfied" that the restriction is not unreasonable having regard to the balance between the circumstances of the exemption and any detriment which the general public, or any persons not party to the agreement, may suffer as the result of its operation.

Thus Section 21 contains the key passages of the Act. The effectiveness or otherwise of judicial review, and indirectly of registration, turns on the meaning placed on this section. The difficulty is to know how the Court will set about its task—what landmarks it will take for its interpretation. Prediction is scarcely possible. However, as a guide to thought, the elements of the problem may be displayed by considering the two extremes in interpretation open to the Court.

On the one hand there is the mild pragmatic approach which considers each agreement on its merits. On this interpretation the legal presumption against restrictive agreements has no particular significance. In using this device the legislature avoided any definition of what is against the public interest. Equally, there is no definition of what is in the public interest. There is merely listed a number of situations, proof of which enable the Courts to be satisfied that the presumption is displaced. Thus presumption emerges as a procedural device for judicial examination and with no further implication than this. Following on this line of argument, the list of exemptions then becomes ground for discovering "merit" in an agreement and gives fairly wide discretion to find reasons why it should continue to be practiced. In particular clause (*b*) invites consideration of a wide range of mitigating circumstance. Further, in anticipation of the tailpiece, the counsel for respondents will be in a position to make references to the general advantages of restrictive schemes ; and to counter, Registrar's counsel will then be obliged to emphasise the general advantages of competition. The area of debate is immediately widened : instead of being confined to the issue whether or not the agreement comes within the terms of one or more of the exemptions the whole subject of competition as against regulation comes under review—an exercise which would seem to favour the mild pragmatic approach if the Court permits its development.

On the other hand there is the severe, ideological dogmatic approach. From this point of view the legal presumption becomes stronger, indeed crucial, to a reading of the Act : "deemed to be contrary to the public interest" means "conclusively considered for the purpose of the legislation" to be so ; and establishes a rule intended to prevent any claim for exemption except on clear and indisputable evidence. The exemption provisions then are no longer methods of establishing "merit" ; they become "tests" to provide "routes of escape" or "gateways" ; and the language of the exemptions becomes restrictive not discretionary. For example, under clause (*b*) of Section 21 the "other specific and substantial benefits" of a restriction must be demonstrated as being considerable,

concrete, self-evident benefits or advantages which can be appreciated by the ordinary "purchaser, consumer or user" of the good. And they may not be benefits which depend on hypotheses concerning, for example, the stabilising qualities for the economy of price-fixing practices, the necessity to guarantee a certain minimum business income in order to maintain maximum rates of innovation and technical progress in an industry, etc. If this is to be the interpretation the Registrar, to "win" his cases, need only show that the alleged benefits are non-existent, unsubstantial, not specific enough. Most agreements would then never reach the tailpiece stage to have their advantages and detriments "balanced." In other words the assumption behind the Act is that competition is, normally, superior to restrictive regulation by privately organised associations of firms. And the discovery of the public interest is not simply an examination of matters of fact in order to assess which balance of restriction and freedom in particular trades gives the greatest utility to the public. To some extent the answers are already determined.

Will the Act be pragmatic or dogmatic, soft or severe is then the question. One significant item supports the severity interpretation. The 1948 Act, it is generally agreed, provides a cautious pragmatic approach to the problem of restrictions and preventions of competition. But we find that the 1956 Act, by contrast, studiously avoids the public interest instruction of the earlier Act that "all matters which appear in the particular circumstances to be relevant shall be taken into account." There is provided only a short list of specific matters on which the Court is asked to find.

* * *

To posit the extremes is not to predict the outcome. Perhaps the Court will find a middle course. It is quite possible that, in the event, the machinery set up by the Act will yield evidence on which it is feasible to assess, with reasonable certainty, where the public interest lies. Then the superiority of competition principle would be necessary only for a small number of borderline cases—to give the consumer the benefit of the doubt.

But one must remain sceptical that the pattern will develop as neatly as this. The Court will be operating in a most difficult field ; on the boundary if not outwith the natural area of the judicial function. The facts will be numerous and confusing enough ; and even more confusing will be the varieties of interpretation on those facts put forward by accountant, economist, business man, engineer and lawyer. And how does a court weigh in the balance conflicting "expert" evidence ? Then it must be kept in mind that the Act provides for summary determination of agreements of a similar character in the light of precedents established by the Court. If order does not evolve from the chaos of facts pressure is therefore placed on the Court to impose it, albeit arbitrarily. Almost certainly this would require having a strong presumption in one direction or the other—in favour of competition or restriction. The economist can have little doubt where the balance of advantage lies for society ; bearing in mind the intellectual and professional traditions of English law it is likely to be a more difficult choice for the Court.

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The 1956 Restrictive Trade Practices Act: Price Agreements and the Public Interest[1]

The first Part[2] of the 1956 Restrictive Trade Practices Act provides for the registration of certain types of restrictive agreement, for their judicial investigation by a special Court, and for their prohibition if the Court finds them contrary to the public interest. Although at the time of writing there has been no experience to show how the Court will interpret the Act, it seems useful to state and to discuss in relation to the public interest the kind of economic arguments that might be used in attempting to justify these restrictions before the Court. At the same time some of the problems which arise from the way in which the public interest is defined may be considered. In order to limit the study to a reasonable size the arguments will relate only to certain forms of restrictive price agreement.

Frequent reference will be made to the work of the earlier Monopolies Commission established in 1948. There are two reasons for this. First, many features of the Act can be traced directly to the recommendations of the Commission—particularly those in their general report *Collective Discrimination*[3]—and second, because the restrictive arrangements on which the Commission reported in some detail are similar to many of those which will appear before the Court under the 1956 Act. The Commission itself examined these arrangements in relation to the public interest, but the criterion applied was quite different from that which the Court will use. This paper will begin, therefore, by stating these two criteria of the public interest and by comparing them briefly; the main part of the study which follows will consider the arguments used before the Monopolies

[1]I wish to thank Professors H. G. Johnson and E. Devons for their helpful suggestions.

[2]Other Parts, which will not be discussed in this paper, prohibit the collective enforcement of resale price maintenance and strengthen the enforcement of individual price maintenance, and amend the 1948 and 1953 Monopolies and Restrictive Practice Acts to reconstitute the Monopolies Commission and to limit the scope of their activities.

[3]Full titles of the reports discussed in this paper are given in the appendix.

Commission in relation to the 1956 version, and will indicate the views the Commission took of them.

II

The 1948 Act stated that in determining whether the operation of monopolies or restrictive practices was against the public interest—

> "all matters which appear in the particular circumstances to be relevant shall be taken into account, and amongst other things, regard shall be had to the need, consistently with the general economic position of the United Kingdom, to achieve—
>
> (*a*) the production, treatment and distribution by the most efficient and economical means of goods of such types and qualities, in such volume and at such prices as will best meet the requirements of home and overseas markets;
>
> (*b*) the organisation of industry and trade in such a way that their efficiency is progressively increased and new enterprise is encouraged;
>
> (*c*) the fullest use and best distribution of men, materials and industrial capacity in the United Kingdom; and
>
> (*d*) the development of technical improvements and the expansion of existing markets and the opening up of new markets".[1]

Despite considerable vagueness in this statement, particularly at the beginning, it is clearly intended to indicate an objective: this is to achieve efficient production in an expanding economy (efficiency is referred to in three paragraphs and expansion in two), and to satisfy consumer demand in the best manner possible. But there is no mention of the ideal approach to this situation, the ethic of business behaviour to be encouraged, or the type of institutional arrangement to be followed. In these matters, which determine the nature of the recommendation that should be made, the Commission was quite free. Contrast this approach with the 1956 version.

The 1956 'presumption as to the public interest' (which will be discussed in some detail below) states that a restrictive agreement within the meaning of the Act will be deemed *contrary* to the public interest (and therefore void) *unless* the Court is satisfied of one or more of seven circumstances: these describe certain 'benefits' (such as the protection of the public against injury, the prevention of local unemployment, to enable persons to negotiate fair terms from a powerful buyer or seller) which are achieved by the restriction. And further, the restriction

[1] 1948 Act, s. 14.

must not be unreasonable when these 'benefits' are weighed against any detriments due to the restriction.

In contrast to the 1948 version the objective which the condemnation of certain forms of business behaviour is intended to achieve, and the reason for their ultimate prohibition if contrary to the public interest, is nowhere indicated.[1] The whole procedure seems to be based on the idea that the general good lies in freedom from restriction and restraint—except where particular groups of people are likely to suffer unduly.

In practice the recommendations of the Monopolies Commission, which were presumably designed to reach the stated objectives, generally placed emphasis on the free operation of market forces, on less restriction and restraint—except in some circumstances which the Commission considered exceptional—and there were few suggestions that the improvement or extension of the restrictions which they examined might lead more rapidly or more effectively to these objectives. Their view as to how to achieve efficiency, expansion and consumer satisfaction appeared therefore to coincide broadly with the ' presumption as to the public interest' in the 1956 Act.

There is, it would seem, no major inconsistency between the two criteria. Both lead—or have the intention of leading—to freedom from restriction and restraint except in special circumstances, but as suggested by the analysis which follows, the application of the two criteria to any particular case may not always lead to the same conclusions. Most likely this is because the exceptions are specified in the 1956 Act whereas the Monopolies Commission had no guide. There is one other possible reason. The Monopolies Commission condemned monopolies or restrictive practices which operated 'against the public interest', but they did not condemn those that were 'neutral',[2] that is those not operating actively *in* the public interest. The seven circumstances in the 1956 Act all specify that some 'benefits' should result from the restriction; if no positive 'benefits' result it cannot satisfy any of the circumstances and it would therefore

[1]Except by Mr. Thornycroft. "The purpose . . . is to secure that the virtues of free enterprise—initiative, adaptability and risk-taking —are not throttled by restrictions imposed by industry upon itself". *Official Report Commons Debates* 1955-56, *Vol.* 549, p. 1927.

[2]Except in the majority report in *Collective Discrimination.*

be contrary to the public interest. This shift in the centre of gravity may exclude some restrictive agreements under the 1956 Act which have been permitted under the earlier Act.[1]

III

In the rest of this paper we shall discuss, in relation to the public interest in the 1956 Act, some of the more important economic arguments which, judging from reports of the Monopolies Commission, might be used in connection with certain types of price agreement. More specifically the Act requires the registration of agreements about the "prices to be charged, quoted or paid for goods supplied, offered or acquired, or for the application of any process of manufacture to goods".[2] This seems to cover a number of different practices such as collective resale price maintenance, maximum, minimum, and fixed price restrictions, level tendering, contract allocation by prior price agreement, and aggregated rebates. To limit the analysis the arguments which follow are confined to maximum, minimum, and common price restrictions (in the last case all firms have to charge identical prices for a given commodity). These have been selected for three reasons: first, that restrictions of this nature are very widespread in the British economy; second, that the reports of the Monopolies Commission offer plenty of examples of cases of this kind (in 14 out of the 20 individual industry reports these restrictions were discussed); and third, that the Commission was to have considered in a general report "common prices and agreed tendering",[3] but under the 1956 Act this investigation was allowed to lapse which leaves a wide opportunity for discussion.

It has been mentioned that under the 1956 Act all restrictive agreements will be deemed contrary to the public interest unless

[1]The Monopolies Commission was reconstituted under Part III of the 1956 Act to investigate monopolies in the home and the export trade and it is still using the 1948 version of the public interest. Both versions of the public interest are therefore in use simultaneously but applied to different sectors of the economy.

[2]1956 Act, S.b.(1)(*a*). There are four other categories of agreement which must be registered: these relate to restrictions between two or more parties about terms or conditions (of supply acquisition or manufacture), the quantities or descriptions of goods, the process of manufacture, and the persons or areas (which may be supplied, etc.).

[3]Annual Report by the Board of Trade for the year ending 31st December, 1955, p.4.

two conditions are satisfied: first, that one or more of seven circumstances are present (these have become known as the "gateways"), and second that the restriction is not unreasonable having regard to the balance between those circumstances and any detriment to the public due to the restriction. This second condition (which has been called the "tailpiece") applies to all the seven "gateways", and it is obvious that all restrictions of the same type will result in detriments of the same nature through whichever "gateway" they are deemed to pass. In consequence the procedure will be first, to discuss the price restriction arguments in relation to each of the seven "gateways", and second, to discuss the general arguments which appear in principle to come under the " tailpiece".

(a)

The first "gateway" through which a restrictive agreement may pass is where the restriction is

> "reasonably necessary, having regard to the character of the goods to which it applies, to protect the public against injury (whether to persons or to premises) in connection with the consumption, installation or use of those goods".[1]

There are two principal economic arguments which seem likely to be used in support of a price restriction for this purpose. One, where manufacturers say that in order to quote the low prices which result from severe price competition some firms would lower quality, and the other, where distributors say that under price competition their earnings would be insufficient to enable them to provide the expert service without which the public might suffer injury. Both arguments are similar in that they refer to quality deterioration resulting from price competition. Before referring briefly to an actual case in which one of these arguments was put before the Monopolies Commission, what are the conditions which one would suppose necessary to show that a price restriction is justified under this "gateway"?

[1]1956 Act, s.21(1)(*a*). This is clearly a generalisation of the first exception to the general prohibition of restrictive agreements suggested by the Monopolies Commission in *Collective Discrimination* (p. 84). The Commission referred to the case "where final consumers are not able to judge the standard of service which it is in their interests to demand from distributors, e.g., where they are unlikely to appreciate fully the risks resulting from faulty installation or service".

The operative word in the Act seems to be 'injury', but the economist cannot say anything about the degree of seriousness of this injury that the Court might accept. Even when the seriousness of the injury is established it does not necessarily follow that the public must be protected. The need may not arise unless buyers are unaware of quality deterioration when it occurs, for if the risks of buying inferior goods or services are apparent the case for preventing the chance of injury may seem rather weak. Just how great is the probability of injury even with full knowledge is a matter of the individual circumstances of the case; there are always some people who will act stupidly and it may be claimed that they need protection. Even if buyers are unaware of quality changes it would seem crucial to show that quality is in fact likely to deteriorate because of price competition, and that the restriction leads to quality being maintained. Finally, the Act, by stating that the restriction must be 'reasonably necessary' to provide this protection, implies that no alternative methods should be available, for example the setting and enforcement of minimum standards of manufacture or the requirement of certificates of competence from distributors.

The Monopolies Commission report on *Insulated Wires and Cables* contains the kind of argument which might appear before the Court under this "gateway"; the Commission referred to "the immense importance of maintaining a high level of quality in this industry",[1] and it may be assumed that they had in mind the danger of physical injury. The Commission's view was that both for rubber cables and covered conductors "vigorous price competition might lead to some deterioration in standards of quality and . . . that the C.C.A. (Covered Conductors Association) should be permitted to fix minimum prices . . . with the same provision for review as . . . for rubber cable".[2] The Commission recommended the restriction because they could not "dismiss as altogether groundless the fear which undoubtedly exists in the industry" that to meet price competition quality would deteriorate, and because of the need to maintain "a measure of stability in this industry as a vital

[1]*Op cit.* p. 81.

[2]*Op. cit.* p. 82. At the time of the enquiry common prices were charged for these products.

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national asset in peace and in war".[1] There was, however, no real attempt to discuss whether the contention of the industry was reasonable. Nor could pieces of evidence taken from different parts of the report be fitted together to form a convincing case (to the present writer at least). For example, there was no evidence in the report of the quality deterioration of covered conductors at any time in the past, and in the case of rubber cables the only evidence related to the year 1899 before the Cable Makers' Association was formed. The industry's main argument was that under price competition the collaboration between firms, on which adherence to the Associations' quality standards depended, would cease; but the Commission held that "the B.S.I. (British Standards Institute) standards are now a very considerable safeguard of quality",[2] and the industry did not argue that collaboration was necessary to maintain these standards. The main conclusions suggested by a careful study of this case is that the Commission were not rigorous in their analysis of the industry's claims, and that the arguments presented were not sufficient to validate the case that quality would be likely to deteriorate.

(b)

The second "gateway" is concerned with the denial of advantages, and states "that the removal of the restriction would deny to the public as purchasers, consumers or users of any goods other specific and substantial benefits or advantages enjoyed or likely to be enjoyed by them as such, whether by virtue of the restriction itself or of any arrangements or operations resulting therefrom".[3] Apart from switching the emphasis from the advantage that the restriction brings to the consequences of its removal, and from being more precise by using "would deny" instead of "reasonably necessary", this is a continuation and a broadening of the first "gateway". But in other respects it is very vague, and it seems as though "specific and substantial benefits or advantages" is a hold-all into which all conceivable benefits or advantages could be fitted: the exact meaning of 'specific' and 'substantial' will no doubt occupy the

[1] *Op. cit.* p. 81.
[2] *Op. cit.* p. 77.
[3] 1956 Act, s.21(1)(*b*).

lawyers' attention. Moreover, 'the public as purchasers, consumers or users of *any* goods' suggests that benefits to a wide body of consumers are to be included whether or not they are consumers of the goods subject to the restriction. The Act defines purchasers, consumers or users as including "persons purchasing, consuming or using for the purpose or in the course of trade or business",[1] and it seems therefore that benefit to intermediaries, such as wholesalers and retailers, are also to be included. These broad interpretations of 'the public' will be adopted in the discussion that follows; if the Court also adopts them then this "gateway" will be much easier to pass through than if a narrower view is taken.

It will be convenient to distinguish between the cases where free prices would be lower than the restricted minimum over short and over long periods; similarly where free prices would be higher than the restricted maximum (space limits the discussion of this topic); and discuss separately the combined cases of fixed or common prices.

In arguments which seem most appropriate to the *short run* and where prices are prevented from falling, the investigations of the Monopolies Commission show three main benefits—or supposed benefits—to the public which are claimed to result from the restriction. The first and most common argument is that price competition, which the restriction aims at preventing, would result in a fall in the quality of products or of the service given; the second that it would interrupt long-term plans for development and re-equipment; and the third that capacity and employment could not be maintained in a recession so that when demand recovered the factors of production would not be immediately available or would be in poor condition, and the public would suffer either through higher prices or in some other way.

The principal economic argument under the quality heading has already been mentioned—that price competition would lead to quality deterioration; but now instead of lower quality being the cause of injury it is said to deny the public some other benefit. In a few reports of the Monopolies Commission the

[1] 1956 Act, s.21(2).

nature of such benefit was obvious (for example, maintaining the quality of rope supplied to the shipping industry, as argued in *Fibre Cordage*), but the *Linoleum* report suggests a more subtle argument which assumes the ignorance of consumers about quality changes. If quality has fallen such consumers might be cheated into paying unjustifiably high prices for inferior goods, and to prevent this is, it might be argued, a benefit to them. But, as the Commission replied, a price restriction could not be an effective guarantee against this happening. There is an extension to this argument. The purpose of the restriction is to prevent prices from falling; if prices fell under conditions of severe competition and led to a deterioration in quality it cannot be held that to prevent this happening is a benefit unless quality falls so low that the goods become unserviceable. To prevent quality from falling to any level above the minimum useful standard is in fact to deny a benefit to those who want to buy low-grade goods at low prices (and such demand may increase during a recession). Manufacturers are unlikely to refuse to supply high quality goods if offered those prices ruling before the recession began.

The short run quality argument appeared in 11 cases before the Monopolies Commission, but in 10 of these the Commission either made no comment or rejected it as invalid (the only acceptance was in the *Insulated Wires and Cables* report). The most common reasons for rejection were the presence of buyers informed about quality (as, for example, in the *Fibre Cordage* case), and the existence of competing goods or of competitors who were not parties to the agreement. In some cases there were large buyers exercising countervailing power. In these reports the Commission in effect denied that the restriction was necessary to prevent quality deterioration. And in the *Linoleum* case the Commission argued that the price system could not prevent producers from lowering quality if they so wished.

There are two approaches to the question as to how a price restriction could prevent the interruption of long-term development plans and maintain employment and capacity in a recession; one is to argue that if the restriction raises profits above the level that they would be in its absence business men are enabled to do these things, and the other is to argue that if uncertainty

(about future prices) is removed, confidence is maintained, and business men react accordingly. It is obviously difficult to generalise about the effects of a recession on confidence and uncertainty (some firms may re-equip in a recession and so accelerate the implementation of long-run plans), and in any case it would be difficult *ex ante* to show benefit to the public. It may be more useful to discuss the first approach, whether the restriction enables business men to do these things. For the argument to be valid it seems necessary to establish that the price restriction should raise profits above the level that they would be in its absence, that profits should be used for this purpose, and that firms should be restricted by low profits to doing less than would be profitable to them. Under what conditions are profits likely to be raised by the restriction above the level that they would be without it?

Let us assume that there is a recession: demand and output have fallen. Now unless demand is completely inelastic the level of output will be even lower with the restriction than without it. Average total costs of the individual firm at substantially less than full capacity is likely to be shown by a downward sloping curve which will be steeper the higher the ratio of fixed to total costs. And, if the price fall does not drive anyone out of business, a firm's total revenue will fall where demand elasticity is below unity. Hence, where the removal of a minimum price restriction leads to lower prices and higher output, lower profits are more likely to result for firms in an industry which is not highly capitalised and where demand elasticity is low than where the opposite conditions are present.[1] But this conclusion needs refinement since prices may well fall below the unit variable costs of some firms and drive them out of business, which will raise the profits of the surviving firms, while the amount by which prices fall is obviously not independent of costs and the level at which prices are fixed. Prediction

[1]The point was made in the *Electrical Machinery* report (p. 259), where the opposite conditions were present (the industry was fairly highly capitalised and the demand elasticity for its exports was high), that a price cut might be "shrewd business" for a firm bearing in mind its available capacity and the fixed overheads which have to be met.

in any actual case is therefore extremely difficult without greater knowledge than is usually available.[1]

The argument that where additional profits result from the restriction they would be used to maintain capacity needs some examination. In the short run it seems to apply where lack of finance in a recession forces capacity out of the industry which either would be difficult to reclaim once demand recovered, or would take time to be replaced by new equipment.[2] The industry may argue, therefore, that without the restriction prices would be higher immediately on recovery from the recession than if capacity had been maintained (which assumes a fairly sudden increase in demand), and that demand is satisfied less quickly and efficiently. These, however, are very short-run benefits, and it is difficult to see what advantages there could be in the long run.

Moreover, to maintain idle capacity when otherwise market forces would remove it can be justified only if the industry's view of the brevity of the recession proves correct, and if recessions are fairly frequent. The longer activity remains low the more urgent it becomes that these resources should be used productively elsewhere, and that consumers should be relieved of the costs involved. And it seems an important condition that short recessions should be fairly frequent, for if they are not

[1]It is surprising that, so far as the writer is aware, there has been no empirical research into the effects on profits, employment, output, etc., of removing a price restriction; there may be more scope for this in the future.

[2]In the *Electrical Machinery* Report the argument was that "if the weaker manufacturer is put out of business in the process (of price cutting in a recession), his capacity will be missed when the market strengthens and the surviving manufacturers will then be in a position where they can charge exorbitant prices for their products". (*op. cit.* pp. 249, 230). The Commission thought it unrealistic to suggest that manufacturers could charge what prices they liked, but that even if high prices did result, from a sudden and overwhelming increase in demand, this would be likely to be corrected by the introduction of new capacity (p. 249). In the *Electric Lamps* Report the industry also argued that "periods of uneconomic prices drives competitors from the field and are necessarily followed by increased prices". *Op. cit.* p. 84.

then to permit a restriction purely as a long-run safeguard[1] is to incur permanent detriments to the public for the sake of benefits which may never be forthcoming. If in a recession a firm then requires additional finance to maintain its capacity it could be held that this should come from the capital market. But if the industry is for some reason prone to fluctuations[2] it is reasonable to argue that firms should have anticipatory arrangements to deal with the recessions which did not involve restrictions—for example by having special reserves, or by diversifying their activities.

Similar reasoning applies in the argument for maintaining employment in a recession as it does for capacity, but there is a further important point. If demand elasticity for the industry is above zero then demand would be reduced by an effective minimum price restriction. Although production might be less efficient at the consequentially lower level of activity, employment would normally be expected to fall but by something less than output. And to show that employment would be maintained by the restriction, it would have to be demonstrated that this expected fall in employment was exceeded by the number of employees financed entirely out of the increased profits.

Where it seems that low prices would hold for a *long period* without a restriction the capacity and employment argument may now be expressed in terms not of the need to retain factors of production during a recession, but of enabling the industry to earn sufficient long-run profits to provide for depreciation, carry out research, pay adequate wages to retain its (skilled) labour force, and to attract efficient business men. Without the restriction, it is argued, the quality of its production and service would steadily deteriorate and people with talent would not enter the

[1]A distinction can be made between the claim that the restriction acts purely as a safeguard against the consequences of a recession, which was argued clearly in five reports, and the claim that under any "normal" conditions insufficient profits can be earned without a restriction to ensure the long-run survival of the industry except under inefficient and low wage conditions. *Calico Printing* appears to come in this category (*op. cit.*, p. 61), but it is not clear which argument was being made in *Sand and Gravel* and *Metal Windows and Doors*.

[2]As in *Copper Semis*, p. 84; *Calico Printing*, p. 60. See also *Rainwater Goods*, p. 50. It is possible, of course, that price stability has so accentuated fluctuations in demand that the industry is able to enter special pleading on account of output instability.

industry.[1] If it is a matter of survival, there seems no reason on economic grounds why any particular industry which cannot survive unaided in the long run should do so. If it is a matter of long-run inefficiency and the production of low quality goods, it would be a very peculiar situation, needing careful analysis, if there was a strong long-run demand for high quality goods at profitable prices which no producer would satisfy. If the price of these goods is too high for most consumers, that is unfortunate. It may be held that a prop to the industry at the present time could lead to its efficient survival so that later it would not need assistance; and to deny assistance now is to prolong unnecessarily the period of adjustment.

Such an argument may be used if the industry has suffered a serious decline in activity (resulting for example from a fall in exports or from an increase in cheap imports that seem likely to be permanent) which has left it with a large amount of surplus equipment. It may be held that the restriction, although it makes imports even more competitive or deepens the decline in exports, enables at least some firms to earn sufficient profits to rationalise the industry by the purchase and disposal of this surplus[2] for them to operate eventually on a profitable basis without the restriction. Unless minimum prices are fixed, firms which plan eventually to leave the industry will charge prices which do not allow for interest or for the replacement of capital, and this creates difficulties for other firms aiming to stay in business and saps their confidence. Such special pleading is perfectly understandable. It is true that some firms may be in temporary difficulty which is serious to them, but the same arguments apply as before: in the long run some firms will survive if the public wants their goods at profitable prices, but if they don't survive because the public prefers imported or other goods, then

[1]For example, in *Calico Printing* the industry held that the "minimum price list was instituted primarily to prevent degeneration of the industry and to ensure a reasonable living for those engaged in it" (p. 61). In *Linoleum* it was held that quality has risen since there has been no cut-throat competition, and the public obtain a better quality linoleum than they would without the common price system. (p. 45).

[2]Where such a scheme of rationalisation has been certified by the Board of Trade under Part XXIII of the Income Tax Act 1952, parties to this agreement are exempted from registration under Part I of the 1956 Act (s. 8(2) refers).

their departure is no loss to the economy. However, the industry concerned may point out that the process of rationalisation through the operation of a price restriction brings about the same end structure sooner and less painfully than if left to market forces, that it brings confidence to the industry, and that the public benefits by having an efficient industry more quickly. This may be true, although it is hardly likely that the same structure would result.

It is possible, however, that the restriction itself has just kept marginal firms in the industry, has delayed the action of market forces, and has therefore provided the need for some arrangement to reduce capacity; without the restriction these firms might already have left the industry, and the problem of disposing of surplus capacity would not have arisen.

The reports of the Monopolies Commission provide many further examples of arguments which were intended to support a minimum price restriction, but some of these are more appropriately discussed in relation to the common price system which restricts the movement of prices in both direction. Before turning to this aspect of price regulation it will be useful to mention some alleged benefits or advantages due to a maximum price restriction.

For obvious reasons maximum price restrictions are less common than restrictions on the minimum, and to shorten this paper some alleged benefits which may follow from the former type will be stated but not discussed. These are that prices are kept down to consumers, that inflation will be stemmed, and that long run over-expansion of capacity is discouraged. If the lower price due to the restriction raises the level of demand and output, wholesalers and retailers may expect to gain—providing their lower margins are outweighed by the increased volume of trade. Precisely how the public is affected by the different allocation of resources and the different distribution of income is impossible to say in the absence of further information about the rest of the economy.

In practice *common prices* were charged in 14 cases investigated by the Monopolies Commission, although formally some

agreements required adherence only to minimum prices. Many of the arguments used in trying to justify these price arrangements have been mentioned under the minimum and maximum cases separately, but in addition some arguments relate more specifically to the benefits—or supposed benefits—of price stability. These benefits were considered to have arisen from the diversion of competition from price to quality and service,[1] from the close technical co-operation between firms[2] and collaboration over cost data,[3] which, it was considered, were incompatible with price competition, from the encouragement of research,[4] from a higher level of capital investment,[5] and from specialisation and the elimination of uneconomic lines.[6] Where

[1] *Calico Printing*, p. 62; *Copper Semis*, p. 83; *Electrical Machinery*, p. 232; *Fibre Cordage*, p. 70; *Linoleum*, p. 45; *Sand and Gravel*, p. 60. In no case was the Commission favourably impressed with the argument. Their view is perhaps best stated in *Copper Semis*, p. 92: "we do not think that concentration on quality or competition in quality and service can be regarded as eliminating the desirability of price competition between suppliers". But the most serious criticism of the argument, that some consumers may prefer a lower quality or service at a lower price and that to achieve high standards may thwart this demand, was only hinted at in one report, *Sand and Gravel*, *p*. 66. In *Linoleum*, p. 58, it was recognised that the restriction might result in quality being unnecessarily high.

[2] *Copper Semis*, p. 84; *Electric Lamps*, p. 83; *Electrical Machinery*, p. 158; *Fibre Cordage*, p. 70; *Metal Windows*, p. 67; *Sand and Gravel*, p. 59; *Valves and CRT*, p. 107; *Wires and Cables*, p. 77. The Commission accepted the argument, that the absence of price competition was necessary to technical co-operation, in the case of *Electric Lamps*, but there was little to distinguish this case from, for example, *Wires and Cables*, where the argument was not accepted. Reasons for rejection were either that no close degree of collaboration had resulted, or that the price agreement was unnecessary to that collaboration. In *Insulin*, p. 23, technical co-operation was related only by implication to the price arrangements.

[3] In the case of *Metal Windows* this was, *inter alia*, a reason for accepting the restriction (p. 80), but in *Copper Semis*, where a similar argument was made, it was not accepted (p. 92). The criterion was whether the exchange of cost data had led to reductions in cost. In other reports, for example, *Pneumatic Tyres*, p. 102, it was argued that the exchange of cost data assisted in determining the common or minimum prices.

[4] *Calico Printing*, p. 60; *Copper Semis*, p. 83; *Electrical Machinery*, p.228; *Linoleum*, p. 45; *Valves and CRT*, p. 58. In no case was the Commission favourably impressed by the argument.

[5] *Calico Printing*, p. 60; *Copper Semis*, p. 84; *Electrical Machinery*, p. 227; *Rainwater Goods*, p. 52; *Sand and Gravel*, p. 58; *Valves and CRT*, p. 58. Again the Commission were not favourably impressed by the argument.

[6] *Copper Semis*, p. 96; *Linoleum*, p. 56. The Commission held that common price agrements discouraged specialisation and the elimination of uneconomic lines.

raw material prices were subject to wide fluctuations it was argued that price stability was advantageous to purchasers, that it tended to stabilise stocks, to encourage stock holding by purchasers, and to prevent speculation[1]. It was also suggested that the orderly price changes which resulted from a common price agreement led to more efficient and easier production programming,[2] and that consumers, particularly retail consumers, preferred price stability; all these—and more—were claimed to result from the operation of a price restriction and were either stated or implied to be benefits, although it was not always made clear who received them.

In general the Commission were not favourably impressed with these arguments, and indeed it is not easy to visualise circumstances in which, even if benefits were proven, they might justify a price restriction. Since there are too many arguments to discuss individually it seems most useful to see the sort of conditions in which they gained acceptance by the Commission. In some cases exceptional circumstances were present which appeared to carry some weight. For example, in view of the unusually close technical collaboration between firms manufacturing *Insulin*, the Commission did not find it unreasonable that a firm should inform other firms before it altered its price.[3] This was the only aspect of price determination on which the Commission commented in this industry, although full discussion took place between producers which resulted in the general acceptance of a price.[4] One may readily accept that in the conditions of this industry uniform prices would result even in a free market, but this does not justify prior agreement unless it

[1]The effect of the restriction on stock holding was a principal reason for acceptance in *Linoleum*, p. 55; the general advantages were accepted as arguments in favour of the restriction in *Pneumatic Tyres*, p. 114, but the argument was not accepted in *Fibre Cordage*, p. 70, on the grounds that demand was insensitive to prices and that the market was so organised that speculation was difficult.

[2]*Pneumatic Tyres*, p. 113; *Rubber Footwear*, p. 63. In both reports the Commission accepted the argument as valid and that orderly price changes was an advantage. In *Tyres*, the benefit appeared to be principally to manufacturers, but also to be "convenient to the whole trade and to the public generally" (p. 113), while in the *Footwear* case the Commission specified advantage only to manufacturers and distributors (p. 78).

[3]*Op. cit.*, p. 31.

[4]*Op. cit.*, p. 25.

can be shown that, *ceteris paribus*, lower prices resulted from the discussions.[1] There was virtually no attempt to justify the method of price determination, and the general view of the Commission was that the system was working well; prices were lower than in other countries; quality was high; the B.I.M firms had achieved their monopoly position through their efficiency, enterprise and experience: consequently the arrangements should not be disturbed.

The same unwillingness to disturb arrangements which seemed responsible for solid achievements appeared in the report on *Metal Windows and Doors*. The standardisation and full exchange of cost data, the fixing of prices by the addition of "reasonable" profits to an average cost weighted heavily by the lowest cost producers, which it was considered had led to cost reduction, and the existance of independent competitors were the main reasons for accepting the restriction.[2] To the Commission the principal question was whether price competition would lead to greater cost and price reductions and to greater efficiency in meeting demand than the then existing system,[3] (this seems a much narrower criterion than the Court may have to apply), and they answered by reference to the spread of costs between firms, and to the reasonableness of both the method of calculating costs and the level of profit margins. They did not discuss whether the costs of the more efficient producers and the industry as a whole might have been even lower under the stimulus of price competition, nor did they consider whether the use of a method such as inter-firm comparison might have achieved an equally useful exchange of cost and operating data.

From these two reports it seems that the Commission were strongly influenced by actual achievements to which the price agreement may or may not have contributed. In *Metal Windows and Doors* they recognised that some of these achievements were due to general economic conditions since the war, but thought that the system had "certain advantages" and did "not find any overriding objection to it"; in *Electrical Machinery*, where there

[1]In the *Pneumatic Tyres* case, the Commission pointed out that although identical prices might still be charged in the absence of agreement, these prices might be lower (p. 113).

[2]*Op. cit.*, pp. 79, 80.

[3]*Op. cit.*, p. 77.

had also been expansion and technical progress, they thought that "the continuing demand for electricity provides much of the explanation, and there is no means of judging how the common price system has affected the degree of progress achieved."[1] Although the Commission were reluctant to disturb price arrangements in an industry which had been sucessful in some important respect, they were clearly mindful that in some cases causal relationships between the two may not have been present.

To take a final example, in the report on *Linoleum* the Commission accepted the industry's argument that price stability "has advantages for the user as well as for the manufacturer and for the small trader who does not buy direct from manufacturers, in that by creating confidence in stocks it prevents dislocation in the distributive trade",[2] and that it encourages the trade to "hold adequate stocks".[3] The meaning of 'adequate' was not explained. The Commission recognised that "the interests of users generally might be better served if prices fluctuated with the cost of materials",[3] but placed greater weight on the evidence from individual retailers that they welcomed stability (for themselves presumably), and from the larger independent manufacturer who thought it beneficial.[4] The Commission implied that consumers benefited from the larger stocks which retailers would hold with stable as compared with fluctuating prices, but the point was not argued whether this really was a benefit, nor was it discussed whether consumers thought it was worth paying a higher price to have a larger stock available. Moreover the Commission appeared to have balanced the advantages to users of price stability against the advantages of price fluctuations; it seems that the Court would have to balance the advantages of price stability (which would be denied by the removal of the restriction) against the detriments due to the restriction; this would include denial of the advantages of price fluctuations, but also other detriments.

[1]*Op. cit.*, p. 250.
[2]*Op. cit.*, p. 57.
[3]*Op. cit.*, p. 55.
[4]This was, *inter alia*, a reason for accepting the restriction.

Faced with all these arguments, some appearing to support and others to oppose the view that stability is in the public interest, what are the criteria by which, under "gateway" (*b*), one should judge them? However one interprets 'the public', perhaps the main criterion of benefit is that in the long run stability should result in lower prices than where fluctuations occur, other things remaining the same,[1] or that there should be equivalent advantages. The difficulty arises in assessing the worth of these other supposed advantages, the better quality or service, the wider choice of goods, etc., and in deciding whether they would disappear where prices were free to move. Distributors may hold that lower prices to the consumer reduces their incomes so that benefit to the consumer by the removal of the restriction is counterbalanced by denial of benefit to themselves; but it does not necessarily follow that the incomes of distributors would in fact fall.

(c)

The other five "gateways" can be discussed more briefly. The third "gateway", which implements a recommendation of the Monopolies Commission,[2] is "that the restriction is reasonably necessary to counteract measures taken by one person not party to the agreement with a view to preventing or restricting competition . . ."[3] The Monopolies Commission did not report in detail any case of a common price agreement entered into for this purpose, but it is conceivable that an agreement to restrict prices combined with a policy of discriminatory pricing, as appeared in several reports, could be an effective counteracting measure which might then come under this "gateway". However the economics of this type of case cannot usefully be discussed without a specific example.

(d)

A restriction may come in the fourth category if it can be shown to be "reasonably necessary to enable persons party to the agreement to negotiate fair terms for the supply of goods to, or the acquisition of goods from, . . ." a powerful buyer or

[1]In principle, of course, economic welfare should be the only criterion of benefit, but this is a difficult concept to apply correctly.

[2]*Collective Discrimination*, p. 84.

[3]1956 Act. S. 21 (1) (*c*).

seller.[1] To say just what is fair or unfair poses difficult problems for the Court. Is it, for example, unfair for a powerful buyer to depress prices changed by suppliers, or to threaten to produce the goods himself unless prices are reduced, if this is the only way to activate those suppliers to greater efficiency? And would the same judgement be made if the motive was not to pass on lower costs to the consumer but to benefit only the monopsonist? The public, therefore, may or may not benefit in the long run from the negotiation of 'fair' rather than 'unfair' terms—whether it does benefit or not is a possible approach to the definition of 'unfair'—but such benefit is not required in the Act to be taken into account in assessing the public interest, the whole emphasis being placed on protection for individual firms. (Detriment to the public due to the presence of the restriction has to be assessed under the requirements of the "tailpiece"). What has been the experience of the Monopolies Commission in assessing the unfairness of actions by a powerful buyer or seller?

Electrical Machinery was the only report in which the arguments were discussed in detail. The manufacturers held that a price restriction prevented the Central Electricity Authority from negotiating prices that are both low and unfair.[2] It was argued that the high degree of capitalisation made the industry particularly prone to price cutting, and that the C.E.A. could "go from one manufacturer to another breaking down their price. They might get a low price from one company short of work; the next company would be told that if they wanted a contract they must quote equally low or go without;[3] once a low price was established it would be regarded as the standard for future contracts, and such a price might cover short-term

[1]1956 Act, S. 21 (1) (*d*). The act makes a distinction, which need not concern us, between the powerful buyer or seller who is in the trade of buying or selling (e.g., wholesalers), and one who is not engaged in such a trade but who, either alone or in combination, controls a preponderant part of the market for these goods (e.g., a nationalised industry).

[2]The Commission found that the common price agreement operated against the public interest, principally on account of the rigidities it introduced, unless this supposed need for countervailing power and any other special circumstances in this case offered compensating advantages which could be claimed for the restriction. *Op. cit.*, p. 253.

[3]*Op. cit.*, p. 238.

costs but not long-term.[1] But in fact the C.E.A., which after 1948 was virtually the sole buyer of certain large machinery, seemed most anxious to ensure that the grounds on which it accepted a tender were fair;[2] moreover, the Commission argued that the suppliers are themselves large public companies who are capable of holding their own with a nationalised industry, and they found it "difficult to believe that the abolition of the (common price) system would tip the balance decisively against the manufacturers".[3]

However, the powerful case against the industry is not that buyers were obviously trying to be fair but that it is economically justifiable for the C.E.A. to try to buy as cheaply as possible, and that if in the future it is not in the interests of any supplier to repeat the low price the C.E.A. will be forced to pay more. Suppliers have just as much right to charge different prices at different times as the C.E.A. has to choose which tender to accept.

Although in three[4] other reports of the Monopolies Commission the industry argued that a common price agreement was needed to withstand pressure from a powerful buyer or seller, in no case was the nature of the unfairness made clear, and in no case did the Commission accept the contention.

(e)

The fifth "gateway" is that

> "having regard to the conditions actually obtaining or reasonably foreseen at the time of the application, the removal of the restriction would be likely to have a serious and persistent adverse effect on the general level of unemployment in an area, or in areas taken together, in which a

[1] *Op. cit.*, p. 228.

[2] The C.E.A. stated that it did "not wish to encourage anything in the nature of 'cut-throat competition', and that if, as a result of price competition, tenderers made offers which were substantially below those of their competitors it would wish to be assured that they were genuine offers carrying a fair expectation of reasonable profit to the tenderer, and not designed to 'knock out' a competitor". *Op. cit., p*. 255.

[3] *Op. cit.*, p. 256.

[4] *Copper Semis*, p. 84; *Fibre Cordage*, pp. 70, 79; *Insulated Wires and Cables*, pp. 79, 80.

substantial proportion of the trade or industry to which the agreement relates is situated".[1]

The exact interpretation of the words 'serious', 'substantial', and in particular the time period implied by 'persistent' is obviously crucial to the effectiveness of this "gateway". Even if these very special circumstances were present—that employment in an area is largely dependent on one industry and that a substantial proportion of the industry is in that area, which the Act seems to require—it would be difficult to argue convincingly that the likely effect of removing the restriction would be persistent unemployment when there are so many alternative courses for events to take: for example, labour might move, industry might become more diversified,[2] or where prices fell, demand, output, and employment might increase. And it is not easy to see how a price agreement could effectively maintain employment against such adverse tendencies implied by the Act. Useful discussion is difficult as there were no such arguments before the Commission (some points have however been mentioned above).

But one may question whether it really is justifiable to prevent unemployment localised in an area or a trade. The requirement that "a substantial proportion of the trade or industry" must be affected is very peculiar. It suggests that this trade or industry should be saved for its own sake even if there is no market for its products, which economically is quite absurd. If unemployment is prevented the incentive for labour to move elsewhere is reduced, and if other work is available there is a clear waste of resources. It may be held that it is a waste of social capital to depopulate an area, but unless there is no alternative it is uneconomic to utilise it simply because it exists. To move labour may create distressing social and economic problems for those remaining who are not connected with the industry operating the restriction, and although these problems are not insurmountable, a case can be made on social but not economic grounds that there should be some occupation available in the area. Finally there is the question whether the costs

[1]1956 Act, s. 21 (1) (*e*).

[2]Since the passing of the 1958 Distribution of Industry (Industrial Finance) Act, it seems very unlikely that serious and persistent unemployment would be allowed to develop without the Government taking action to encourage diversification.

to the economy of preventing localised unemployment would be lower if borne by the consumers of the goods subject to the restriction or if borne by the state (for example in the form of unemployment and National Assistance benefits). The economist would probably choose state assistance as causing less distortion to the rest of the economy, but on social grounds there is a strong case for keeping people employed. It would appear to be principally on social grounds that this "gateway" was included.

(f)

The sixth "gateway" is that

> "having regard to the conditions actually obtaining or reasonably foreseen at the time of the application, the removal of the restriction would be likely to cause a reduction in the volume or earnings of the export business which is substantial either in relation to the whole export business of the United Kingdom or in relation to the whole business (including export business) of the said trade or industry".[1]

The Act exempts from registration those restrictive agreements relating *solely* to exports, but such agreements must be notified to the Board of Trade; to come within this "gateway" the restriction must relate in whole or in part to the home market.

The actual wording of this "gateway" is rather peculiar. It refers to the "volume or earnings of the export business", but it is not stated whether "earnings" means the gross or net earnings of foreign currency, the earnings (profits) of the relevant firms, or the earnings from the goods which are exported produced by these firms. The earnings have to be substantial in relation either to the whole export business of the United Kingdom, which is presumably the credit side of the balance of payments, a figure of over £3,000 million, or to the "whole business (including export business) of the said trade or industry". If the "said trade or industry" refers to the one operating the restriction, an odd situation may arise where this industry is not in fact the exporting industry but is supplying some essential component—the price, quality or supply of which may be affected by the removal of the restriction—to another industry for processing

[1]1956 Act, s. 21 (1) (*f*).

and export.[1] And there is a further complication since the Act does not state which figure (whether sales, profits, assets, etc.) should be taken to represent the "whole business" of the industry.

Although it may be in the public interest according to the 1956 Act to prevent a substantial fall in exports by means of a restriction, it is not easy to see the justification for this. If the fall is likely to be substantial in relation to the total value of United Kingdom exports then clearly some action is necessary, but why should this be a restriction on the part of an individual industry rather than some other measure, such as adjusting the exchange rate or operating the monetary mechanism? Given that there are other methods of correcting a substantial fall in exports it is difficult to believe that if the restriction were removed and exports seemed in danger of falling Government authorities would remain inactive, and further, it seems unlikely that these methods would fail where a restriction succeeded. The likelihood of an industry winning a case on these grounds seems rather remote. The Act also specifies that the substantial fall in exports may be 'in relation to the whole business (including export business) of the said trade or industry'. This seems to be saying that a particular industry which is exporting should be saved from a substantial decline in its activities, but there is really no economic justification for this, and it is difficult to see on what grounds this provision was included in the Act.

What has been the experience of the Monopolies Commission in cases which seem relevant to this "gateway"? The Commission distinguished between international cartels and domestic cartels which related to the export market. In the *Electrical Machinery* case the industry operated a domestic cartel which affected exports,[2] and they argued that because of the low prices charged by their competitors low profits were earned from exports, and it was therfore essential that they should earn good

[1]In the *Copper Semis* report, direct exports accounted for less than 10% of production, "but they supply vital components to industries, especially the engineering and electrical industries, whose products account for a large proportion of the United Kingdom's export trade." (p. 89).

[2]There were two associations concerned with export prices: the Groups and the International Electrical Association Ltd. Although there were foreign members of the I.E.A., only the British members made arrangements for common minimum prices (*op. cit.*, p. 27).

profits in the home market; this, they said, could be achieved only by the operation of their price arrangements.[1] They also argued that the removal of price competition might sometimes result in gaining orders that they would otherwise lose, and in achieving higher export prices. It is, they said, "in the public interest . . . to secure the best possible prices . . . consistently with retaining (their own) goodwill in the market", but at the same time they held that " to reduce the volume of exports would be contrary to the public interest".[2] The Commission's view was that "the public interest in the export field cannot be measured solely in terms of immediate gains or losses in currency earned. In the long run the public interest is best served, in the export market as in the home market, if the level of prices is reasonable both for seller and purchaser and if neither market subsidises the other".[2] The Commission held that the common price agreement was against the public interest principally on the grounds that "the right level of price to quote depends at any time . . . not only on common market factors but also on the circumstances of the individual manufacturer",[3] taking into account his costs and available capacity.

In other reports of the Monopolies Commission some further arguments intended to support a price restriction were that price competition would lead to quality deterioration which would affect both home and export markets,[4] and that where the export trade was in high quality goods the cost of making small lots specially for this market would be high.[5] One industry argued that "it would not be practicable to maintain the arrangements with Continental producers . . . if the price arrangements at home broke down", and it was alleged that these arrangements had enabled the industry to build up its export trade.[6] The need for common prices and international arrangements to preserve the principal foreign markets against dumping by new

[1]*Op. cit.*, pp. 234, 235.
[2]*Ibid*, p. 258.
[3]*Ibid*, p. 259.
See also footnote *supra*, p. 81.
[4]The argument was implied in *Insulated Wires and Cables*, pp. 76, 60. See also *Electrical Machinery*, p. 240.
[5]*Linoleum*, p. 47.
[6]*Copper Semis*, p. 101.

manufacturers was also mentioned[1] (but it was not clear how the agreements would help in this matter). One industry pointed to the dangers of a price war against powerful competitors.[2] The Commission considered favourably the view that if the U.K. was certain to secure an order price competition would only reduce currency earnings, but they feared that the long-run effects of a price agreement on their costs, efficiency and competitive favour in foreign markets would be adverse.[3] Although the Commission were considering the likely effect of forbidding agreements on the level of exports and on the net earnings of foreign currency they did not hazard a guess as to how great might be the fall in earnings; it seems that, in defining the word 'substantial', the Court may have to obtain a rather clearer view about size than did the Commission.

(g)

The final "gateway" refers to a restriction being reasonably required to maintain any other restriction which has been accepted by the Court. Although it may be argued that in some particular case a price restriction was required to support another agreement accepted by the Court, there is nothing further which needs to be said about it.

IV

The 1956 Act states that all restrictive agreements shall be deemed contrary to the public interest unless the Court is satisfied of one or more of seven circumstances, and

> "is further satisfied (in any such case) that the restriction is not unreasonable having regard to the balance between those circumstances and any detriment to the public or to persons not parties to the agreement (being purchasers, consumers or users of goods produced or sold by such parties, or persons engaged or seeking to become engaged in the trade or business of selling such goods or of producing or selling similar goods) resulting or likely to result from the operation of the restriction".[4]

[1] *Copper Semis*, p. 101.
[2] *Pneumatic Tyres*, p. 128.
[3] *Copper Semis*, p. 103.
[4] 1956 Act, s. 21 (1).

No useful comments can be made about this balancing process, except to say that in principle welfare criteria should be applied. It may be useful to state some of the general arguments which seem to be implied by 'detriments to the public'.

It seems that 'the public' may be both a narrower and a wider concept than 'the public' to which benefits and advantages refer in "gateway" (*b*). There the public are 'purchasers, consumers or users of any goods', here the public appears to be qualified by ' being purchasers, consumers or users of goods produced or sold by such parties'. But the " tailpiece" also includes with the public 'persons not parties to the agreement' and it is not clear whether the qualification applies to both or only to the latter : if it applies to both then the definition will be narrower than if it applies only to the latter, but in any case 'the public' seems different from that intended in "gateway " (b).

It will be convenient to consider the effects of minimum and maximum price restrictions separately, and it will be useful to distinguish between the effects on income distribution and on resourse allocation. If the restriction has prevented prices from falling, the principal detriment on the distribution side is the higher price that some consumers have to pay. There is, however, a large element of uncertainty in determining even the approximate size of this detriment; it could be determined by experimentally removing the restriction or perhaps by referring to a period before the restriction was imposed, but conditions may then have been very different. One could refer to the market structure of the industry in relation to the nature of the product and argue in theoretical terms, but then the only indication might be of short run price changes and one could make no sound judgement over the long term. It does not seem that any estimate would have much value, and all that can be said with any certainty is that if the costs of the more efficient firms suggest that the prices they would charge by choice are significantly lower than the prices they are obliged to charge under the agreement, then some consumers are suffering a detriment; and the more firms there are in this position the greater is the detriment. One cannot know its size because one does not know what the long-run costs of these firms would be in the absence

of the restriction, nor the profit margin that they would consider appropriate. For the same reason even if the agreement fixes prices according to the lowest cost producer the public may still be suffering a detriment.[1]

The incomes of distributors and other firms in the industry with the restriction but not parties to it may also have been affected. If demand elasticity is high for the products of this industry then the incomes of distributors may be lowered by the restriction, although simultaneously this gives 'independent' firms in the industry the opportunity to increase their incomes by pursuing a flexible price policy. The size of the income differences of these persons would depend also on the amount by which prices fell, that is on the answer to the problems discussed in the previous paragraph. Whether the position of the wider body of consumers would be worsened by the operation of the restriction may not be a matter for the public interest, and in any case would be difficult to determine. With non-zero elasticity of demand the suppliers of raw materials may suffer a detriment due to the presence of the restriction since the volume of their trade and their profits may be lower, but the definition of the public interest in the Act does not appear to include raw material suppliers; it seems inconsistent to include the detriments to distributors who may be in a similar position as 'innocent victims'.

The most obvious effect of a minimum price restriction on the allocation of resources is that the more efficient firms may be denied the opportunity of quoting lower prices and gaining a larger share of the market at the expense of high cost producers, which would lead to greater efficiency in the industry as a whole. Further, the quoting of lower prices by these firms may be expected to stimulate the less efficient firms to reduce costs and prices and would lead to a further saving of resources even if all firms maintained their share of the market. Although resources may have been used inefficiently in this industry because of the restriction, their *total* use within the industry may be less than under-price competition if the higher price results in a lower

[1]The Commission were favourably impressed wherever they found that prices had been fixed in relation to the lowest cost producers (in particular in *Metal Windows and Doors*), but they did not consider the possibility that the costs of even the most efficient producers might be lower without the restriction.

level of output; the restriction may therefore free resources to be used elsewhere. Whether the industry uses more or less resources than under conditions of price competition it is clear that other industries would be affected by the restriction, but without extensive information about prices and marginal costs in this and other sectors of the economy it would be impossible to say whether the restriction had resulted in a better or a worse allocation of resources. It is, however, quite clear that within the industry itself resources are likely to have been wasted by the operation of the restriction.

It does not seem from the wording of the Act (if interpreted strictly) that any waste of resources as such (that is apart from the higher prices to which it may give rise) is particularly relevant to the public interest under the "tailpiece". It is true that the extra resources used may mean fewer resources available at a given price for 'independents' in this industry, for those 'seeking to become engaged' in it, or for other persons purchasing these goods in the course of their business; but the reverse could also be argued if there are economies of scale in the supplying industries. Detriment is more obviously present where the supply of some factor is fixed. The waste of resources may affect final consumers only indirectly as buyers of other goods which have been affected by it. But since the consumers of goods subject to the restriction may not be important consumers of those other goods affected in price or output by the restriction but not subject to it, the impact on the public interest is likely to be very small and difficult to estimate; for all practical purposes these effects can be ignored. It does not seem that the misallocation of resources in itself is intended to be considered as a detriment to the public under the 1956 Act; in contrast the public interest in the 1948 Act was specifically to achieve "the fullest use and best distribution of men, materials and industrial capacity in the United Kingdom".[1]

The likely detrimental effects on the public (in the sense used in the Act) of a maximum price restriction may be summarised briefly. If the holding down of prices has resulted in

[1] 1948 Act, s. 14 (*c*).

higher demand and output, more resources will be needed in this industry than otherwise and their prices may rise; 'independent' manufacturers and others engaged in producing similar goods may therefore be adversely affected in that their costs also rise. And they may suffer a detriment if they are forced through competition also to charge prices lower than the market seems to warrant so reducing their profits. It did not seem that detriments due to the mis-allocation of resources as such would concern the public interest even if it could be discovered what they were, and it would be almost as difficult to assess the consequences of the restriction on efficiency within the industry and on the 'public' as defined in the Act.

There are, however, a further set of detriments which are likely to be incurred by the public due to the presence of a maximum price restriction. These are, in the short run, that there arises the need for some form of non-price allocation system, which, by the very nature of queueing, rationing, or "black market" activities, is unlikely to secure as efficiently as the price mechanism that those whose needs are most urgent receive their supplies first. In the long run the arrival at an equilibrium position may be delayed in time beyond the period of adjustment necessary if prices were free (assuming no idle capacity) due to the fact that output may have further to rise, and to the fact that entry into the industry may be more difficult where the price-fixing authorities have control over the industry than where this is absent. Moreover profits in the industry may be reduced by the restriction which would lower the incentive to expand.

Some detriments of price stability have been mentioned separately under the minimum and maximum cases. But the particular detriments that the economist would like most to emphasise—that stability in prices may lead to fluctuations elsewhere, and that stability may hinder long-run adjustment in the economy—may not be such important detriments as they seem if a rather narrow definition is given to 'the public or to persons not parties to the agreement'. Moreover, the wider question is raised, which is beyond the scope of this paper, to what extent

from an economic point of view stability is desirable, and whether the stability should be in prices, incomes, employment, output, or some other variable.

The aim in this paper has been to use reports of the Monopolies Commission to point to some of the economic arguments which seem likely to be used before the Restrictive Practices Court: in so doing some aspects of the 1956 Act were discussed. It seemed from the few examples given that the application of the two versions of the public interest (in the 1948 and the 1956 Acts) to any particular case might lead to different conclusions. This may have been because the 1956 Act states the kind of behaviour to be achieved whereas the 1948 Act does not, and because the Commission permitted restrictions to continue which were 'not against the public interest'; for a restriction to continue under the 1956 Act something more positively beneficial seems to be required. It did not appear likely that the judgements of the Monopolies Commission could provide an adequate or a useful guide to the outcome of similar cases before the Court. It was sometimes difficult to see the rationale behind the inclusion of certain provisions in the 1956 Act, in particular in the "gateway" which referred to exports. The wording of the public interest in the Act appears to offer fairly clear directives as to intention, but nevertheless interpretation is needed on a great many points. In certain respects the Act seems deliberately vague—particularly in "gateway" (*b*), which is probably the most important of the seven, and in the undertaking of the crucial balancing process between benefit and detriment.

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APPENDIX

Full titles of the individual industry reports of the Monopolies and Restrictive Practices Commission mentioned in this paper were:—

1. *Report on the Supply of Cast Iron Rainwater Goods*, March 1950.
2. *Report on the Supply of Electric Lamps*, October 1951.
3. *Report on the Supply of Insulated Electric Wires and Cables*, June, 1952.
4. *Report on the Supply of Insulin*, October 1952.
5. *Report on the Process of Calico Printing*, April 1954.
6. *Report on the Supply and Export of certain Semi-Manufactures of Copper and Copped-Based Alloys*, July 1955.
7. *Report on the Supply and Export of Pneumatic Tyres*, December 1955.
8. *Report on the Supply of Sand and Gravel in Central Scotland*, March 1956.
9. *Report on the Supply of Hard Fibre Cordage*, June 1956.
10. *Report on the Supply of Certain Rubber Footwear*, July 1956.
11. *Report on the Supply of Linoleum*, August 1956.
12. *Report on the Supply of Standard Metal Windows and Doors*, December 1956.
13. *Report on the Supply of Electronic Valves and Cathode Ray Tubes*, December 1956.
14. *Report on the Supply and Exports of Electrical and Allied Machinery and Plant*, February 1957.

The only general report published by the Commission was :—

15. *Collective Discrimination: A Report on Exclusive Dealing, Collective Boycotts, Aggregated Rebates and other Discriminatory Trade Practices*, June 1955.

"Large" and "Small" Numbers in the Theory of the Firm[1]

The problem of group or industry equilibrium is commonly divided into a "large numbers" case and a "small numbers" case. The large numbers case is again subdivided into two: perfect competition and the large numbers case of Chamberlin. It is argued here that what matters to the analysis is not the (arithmetic) number of firms, but the beliefs about the policy of the rival(s) attributed to the individual firm. Number may be relevant as a test of the appropriateness of the beliefs attributed, but number itself is analytically irrelevant, and the distinction in terms of number alone is misleading. To illustrate this we shall consider first the analysis of Cournot and Chamberlin, and then the case of perfect competition. It will be shown that there is no *analytical* distinction between the Cournot solution in the case of two firms and the Chamberlin solution in the case of "many" firms because the same beliefs about the reaction of the rival(s), and hence the same behaviour, are attributed to the individual firm in each case. Not only the analytical tools but also *the equilibrium conditions* are identical. The argument is simply that, if the individual firm is assumed to believe that the price or output of its rival(s) remains constant, its behaviour is independent of whether its rival is supposed to be one firm or many. We then go on to show that the distinction between a "large numbers" group and a perfectly competitive group similarly depends, not on numbers, but on the beliefs attributed to the firms.

There is a subsidiary problem to clear up: the definition of a Chamberlin group in the large numbers case, which is well-known to be difficult if the product is differentiated. In the case of non-homogeneity, the concept of an "equal price change" is ambiguous, and so, therefore, is the "share-of-the-market" demand

[1]The proposition discussed here appears rather obvious, and is mainly of scholastic interest. I discovered it while endeavouring to simplify the analysis for presentation in lectures, and offer it now merely because it does not appear to be generally known. I am indebted to Professor H. G. Johnson, Mr. K. Klappholz, and Dr. R. G. Lipsey for their comments and criticisms.

curve, the DD[1] of Chamberlin's analysis. Non-homogeneity also makes the concept of "equal costs" ambiguous or even meaningless. And non-homogeneity, of course, makes it difficult, or even impossible, to mark off analytically the boundaries of the group. Hence, in order to make Chamberlin's analytical apparatus *work* in the large numbers case, and to obtain the tangency solution with the aid of the "share-of-the-market" and "particular" demand curves, it is necessary to assume a homogeneous product.[1] It is now also necessary to assume that firms adjust quantity rather than price. If this is not done, then in the large number case the demand for the product of each firm is infinitely elastic up to the total quantity which will be taken by the market at each price, and, for further individual price cutting, coincides with the total market demand curve. Thus in order to obtain the "share-of-the-market" and "particular" demand curves of Chamberlin, we must assume that the product is homogeneous, and that each firm adjusts quantity, accepting the new price, instead of quoting a new price itself.

Given, then, that these assumptions are necessary in order to make Chamberlin's analysis of the "large numbers" case work, we can show that it does not differ from Cournot's analysis of the "small numbers" case. In the Cournot case, illustrated in figure 1, we have two firms and a homogeneous product. We assume for simplicity a linear total market demand curve, D_T, and constant marginal costs, identical for each firm. If the two firms charge the same price, sales are equally divided between them.[2] Suppose that each firm is producing OM and that price is MQ. If both increase output by MN, total output increases to OL $(= 2ON)$, and the price that clears the market is OB. But each firm is to assume the output of the other constant at OM. If firm 'A' increases output to ON, it expects total output to be OZ $(= OM + ON)$, and price to be OE. Hence each expects to reach the position P, each increases output by MN, and each actually reaches the position C. Q, C, are, of course, points on

[1]The group we obtain is not the group assumed by Chamberlin ; but it is the group we require for Chamberlin's analysis.

[2]If the product is homogeneous and the market perfect, demand is presumably divided between sellers at random. Analytical convenience requires that we assume the division of sales to be exactly fifty:fifty.

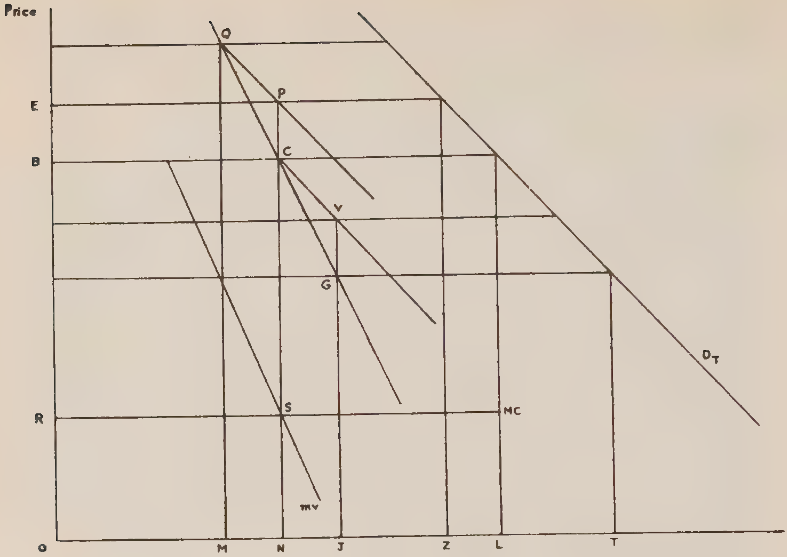

FIG. I.

the curve $\frac{1}{2}D_T$: QC is thus the "share-of-the-market" demand curve or DD', of Chamberlin. Q, P, are points on the curve $D_T - OM$, expected sales on the assumption that the other's output is constant: QP is thus the "particular" demand curve, or dd', of Chamberlin. And, as in Chamberlin's analysis, dd' "slides down" DD': both firms increase output, hoping to reach P, and in fact reach C; through C there passes a dd' curve CV, so that both now expect to reach V, and in fact reach G on DD' with total output OT. If each firm endeavours to maximize profits on the assumption that rival's output is constant, each firm continues to increase output from any position such as Q or C so long as the marginal revenue to the dd' curve through that point exceeds marginal cost. Thus if, in figure 1, marginal cost is constant at OR, and *mr* is the marginal revenue curve to CV, cutting *mc* in S at output ON, C is a position of equilibrium, obviously consistent with any level of (positive or negative) profits. This equilibrium is given by the cost curves, the "share-of-the-market" demand curve QCV, and the particular assumption about behaviour. It is the short-run equilibrium of

Chamberlin's group. In the long run we may alter *QCV* by changing the number of firms as easily in the case in which there are originally "two" as in the case in which there are originally "many." And, if we choose normal profits as a long-run equilibrium condition, we can obtain a tangency solution for *any* original number of firms.[1]

Thus there is no analytical difference between the Cournot duopoly case and Chamberlin's large numbers. The results are in both cases obtained by attributing to the individual firm the same belief about the behaviour of the other(s), and so deriving the same policy, and the same equilibrium conditions. Given homogeneity, and the Cournot-Chamberlin assumption that each firm assumes the other(s) to be paralysed, the number of others makes no difference to the analysis.

We have been considering groups of firms producing a homogeneous product, and selling in a perfect market. An obvious question is how, if at all, a "large" group is to be distinguished from a perfectly competitive group. The answer once again depends, not upon numbers, but upon the beliefs attributed to the firms. We cannot, that is, proceed from a Cournot-Chamberlin group to perfect competition merely by increasing the number of firms. We shall now see how the assumptions must be changed to obtain perfect competition.

Consider the linear-demand duopoly case analysed above. If the market demand function is $p = a - nx$, the particular demand for the product of firm 'A' is $p = a - nx_a - nx_b$, which, when nx_b is assumed constant[2], can be written $p = k - nx_a$. It is obviously immaterial what number of firms is deemed to contribute its output to k; and the slope of the particular demand curve is n whatever the size of k. Thus we cannot obtain the horizontal demand curve of perfect competition by altering the size of k or the number of firms sharing it. So long

[1]There is the difficulty that, if the original number of firms is "small", DD^1 will move in "large" discontinuous jumps when their number alters.

[2]We may complete the usual solution of the Cournot case as follows: assuming x_b to be a constant, total revenue for firm 'A' is $px_a = ax_a - nx^2_a - nx_ax_b$, and expected marginal revenue is $a - 2nx_a - nx_b$, which may be put equal to marginal cost. Expected marginal revenue for firm 'B' is analogously $a - 2nx_b - nx_a$.

as the firm's particular demand curve is constructed by assuming the output of the rivals' constant, and subtracting that constant from the market demand, the slope of the particular curve is necessarily that of the market curve. While the slope of the particular demand curve cannot be altered by changing numbers, however, its elasticity can be, and can be made to approach infinity. This apparent paradox is easily shown and easily resolved.[1] The elasticity of the market demand curve is

$$\eta = \frac{a - nx}{nx};$$

and the elasticity of 'A' 's particular demand curve is

$$\eta_a = \frac{a - nx}{nx_a}.$$

Define 'A' 's share of the market as $S_a = \frac{x_a}{x}$, and

$$\eta_a . S_a = \frac{a - nx}{nx_a} . \frac{x_a}{x} = \frac{a - nx}{nx} = \eta.$$

Thus $\eta_a = \frac{\eta}{S_a}$, and, as the number of firms increases, S_a ('A' 's share) approaches zero, so η_a (the elasticity of 'A' 's particular demand curve) approaches infinity. Thus we have, in the limit, the infinite elasticity of perfect competition, but not the horizontal slope.

The explanation of this apparent paradox is simply that the elasticity is the product of (the reciprocal of) the slope and the ratio of price to quantity, and that we can get it to infinity as easily by altering the latter as the former. When we change the number of firms without altering the construction of the particular demand curve, this is all we do: we move the curve bodily without altering its slope. In the limit the intercept of the curve with the vertical axis takes place at the price at which elasticity is measured, and elasticity is consequently infinity (if S_a is to approach zero without total output approaching infinity, 'A' s' output must approach zero).

It follows, then, that so long as the group is selling a homogeneous product in a perfect market, no alteration in the size

[1]On this point I am particularly indebted to Professor H. G. Johnson.

of the group alters the analysis. To obtain the horizontal demand curve of perfect competition we must drop the Cournot-Chamberlin assumption. We require instead the explicit assumption that the firm believes that changes in its output do not alter price. Between the limits of a single firm and an infinite number of firms, changes in number alone mark off no divisions or subdivisions for separate analysis.

London School of Economics. G. C. Archibald.

Books Received

AGRICULTURAL MARKETING SERVICE, U.S. DEPARTMENT OF AGRICULTURE : *Distributed Lags and Demand Analysis for Agricultural and Other Commodities.* U.S. Government Printing Office, Washington. 60 cents., pp. 121.

BOULDING, Kenneth E. : *The Skills of the Economist.* Howard Allen, Inc. Cleveland. $3.50, pp. 193.

JUCKER-FLEETWOOD, Erin E. *Economic Theory and Policy in Finland,* 1914-1925. Basil Blackwell, Oxford. 15/-, pp. 109.

MACHLUP, Fritz : *An Economic Review of the Patent System.* U.S. Government Printing Office, Washington. 25 cents., pp. 89.

Edited by MORLEY, Felix : *Essays on Individuality.* Un. of Pennsylvania Press. $5.00, pp. 270.

RAMAN RAO, A. V. : *The Economic Development of Andhra Pradesh* (1766-1957). Popular Book Depot, Bombay. Rs. 18.75, pp. 384.

World Exports of Manufactures, 1956 vs. 1937

I.

The main purpose of this study is to show what changes have taken place in the patterns of world exports of manufactured commodities between the years 1937 and 1956[1] in order to determine whether the pre-war patterns have been altered or are tending to be restored.

Another and quite different purpose is the bringing up to date of the findings of Tyszynski, who, in his excellent paper[2] described the most important features of world trading in manufactured commodities between the years 1899 and 1950.

To facilitate comparison, this study adopted Tyszynski's classification of those commodities into 17 commodity groups, which is as follows :

Commodity Group	Designation	SITC Groups or Groups
1	Iron and Steel	681
2	Non-Ferrous Metals	671, 682, 683, 684, 685, 686, 687, 689
3	Chemicals and Allied Products	511 through 599
4	Non-Metalliferrous Materials	661, 662, 663, 664, 665, 666
5	Miscellaneous Materials	611, 612, 613, 621, 631, 632, 633, 641, 642
6	Industrial Equipment	711, 714, 715, 716
7	Electrical Goods	721
8	Agricultural Equipment	712, 713
9	Railways, Ships, Etc.	731, 735
10	Motor-Cars, Aircraft, Etc.	629, 732, 733, 734
11	Alcoholic Beverages, Tobacco Mfs.	112, 122
12	Textiles	651, 652, 653, 654, 655, 656, 657
13	Apparel	831, 841, 842, 851
14	Metal Manufactures, N.E.S.	699, 812, 861, 864
15	Books, Films, Cameras, Etc.	862, 863, 891, 892
16	Finished Goods, N.E.S.	672, 673, 821, 899
17	Not Classified	691, 811

[1]The selection of the years 1937 and 1956 was by no means arbitrary. Both were years of relatively normal business activity in all countries under study and therefore their selection made possible the neglecting of the cyclical factor in the analysis.

[2]H. Tyszynski, " World Trade in Manufactured Commodities, 1899–1950," *The Manchester School of Economic and Social Studies*, Vol. XIX, No. 3 (September 1951).

It should be noted that the composition of the individual commodity groups for the year 1956 differs from that for the previous years. This is due to the fact that the 1956 figures are based exclusively on United Nations sources,[1] whereas those for previous years were compiled by Tyszynski from various other sources. However, the discrepancies, which are to be expected, are of a minor nature and should not affect the findings to any appreciable extent.

This study is primarily concerned with nine[2] countries, namely, the United States, United Kingdom, Germany,[3] France, Belgium,[3] Canada, Japan, Italy and Sweden. These countries accounted in 1956 for about 38·5 billion dollars,[4] or more than 85 per cent of the approximately 45 billion dollars of all countries' exports of manufactured goods, and for roughly 60 per cent ($53,444 millions out of $92,637 millions) of the total exports of all countries, that is, exports of manufactured as well as non-manufactured commodities.

Most of these countries have been well-established exporters of manufactures[5] for several decades and the exports in question represented at least 45 per cent of their total exports in 1956.[6] This is shown in Table 1.

[1]Main source of information was: United Nations, *Commodity Trade Statistics*, Series D, Vol. VI, No. 4 (January-December 1956).

[2]Tyszynski used a group of eleven countries which included in addition to these nine countries also Switzerland and India. To allow comparison, this writer has adjusted all the percentage figures given by Tyszynski for the period 1899–1950 to account for this particular difference between the studies.

[3]The 1956 figures for Germany are those for West Germany only and the figures for Belgium include the exports of Luxembourg as well.

[4]In 1937, the exports of these countries amounted only to approximately 8·5 billion dollars and hence the 1956 figure of 38·5 billion dollars represents a rise of roughly 350 per cent. If adjustment is made for the price rise (the unit value index rose to 329 in 1956 from the base year 1937), the actual increase in terms of volume amounted to only about 40 per cent.

[5]It might be interesting to add that all these countries are important customers of each other's products. The total value of shipments of manufactures by these countries to one another in 1956 amounted to $13,725 millions, or about one-third of all their exports of $38,587 millions of manufactured commodities.

[6]Into the same category fall in addition: Austria (69·3%), Norway (55·1%), the Netherlands (48·0%), and Finland (46·3%). These countries are not taken into consideration in this study, however. This is done in order to make the group as similar as possible to that selected by Tyszynski. Switzerland (57·0%) falls into this category, too, but it is not included because comparable figures to those given by Tyszynski could not be obtained from the United Nations source mentioned previously.

TABLE 1

TOTAL EXPORTS AND EXPORTS OF MANUFACTURED* COMMODITIES OF NINE SELECTED COUNTRIES, 1956
(in thousands of dollars)

Country	Total Exports**	Exports of Manufactured Commodities	Manufactures as % of Total
	$	$	
United Kingdom ...	8,626,014	7,555,438	87·6
Japan	2,492,225	2,183,273	87·6
Germany	7,333,225	6,343,603	86·5
Belgium	3,123,961	2,566,207	82·1
France	4,409,732	3,191,776	72·4
Italy	2,156,617	1,409,063	65·3
United States	18,453,107	11,956,887	64·8
Sweden	1,941,499	1,061,396	54·7
Canada	4,907,482	2,319,116	47·3
All nine countries ...	53,443,862	38,586,759	72·2

Source : United Nations, *Commodity Trade Statistics*, Statistical Papers, Series D, Vol. VI, No. 4 (January—December 1956), pp. 6 and 38—65.

*" Manufactured Commodities " are identical here with those listed under SITC Section 5 (Chemicals), SITC Section 7 (Machinery and Transport Equipment) and SITC Sections 6 and 8 (Other Manufactured Goods). Also included are : SITC Group 112 (Beverages, alcoholic) and SITC Group 122 (Tobacco manufactures) from SITC Section 1.

**The discrepancy between these totals and those given in the source on page 6 is due to the exclusion of SITC Group 911 (Postal packages, n.e.s.), Group 921 (Live animals, n.e.s.) and Group 931 (Special shipments) of SITC Section 9.

On the basis of Table 1 we can now establish the share of " world " exports[1] of each of the nine countries in 1956. This result is shown, together with the corresponding percentages for 1937 and 1950,[2] in the ensuing Table 2 which, in addition, contains some other relevant information.

[1]In this study the term " world exports " is used to denote the exports of the nine countries.

[2]The source of this information is Tyszynski, *op. cit.*, Table VIII, p. 286.

TABLE 2

PERCENTAGE SHARE OF WORLD EXPORTS OF MANUFACTURES OF NINE COUNTRIES IN 1937, 1950 AND 1956

Country	Share in			Change 1937–1956	Change 1899–1937 (Tyszynski, adjusted)
	1937	1950	1956		
United States ...	20·6	31·2	31·0	+10·4	+ 8·7
United Kingdom	23·6	26·9	19·6	− 4·0	−11·2
Germany	23·6	7·7	16·4	− 7·2	− 0·1
France	6·7	11·0	8·3	+ 1·6	−10·1
Belgium	6·2	6·2	6·6	+ 0·4	+ 0·3
Canada	5·3	6·5	6·0	+ 0·7	+ 4·9
Japan	7·6	3·5	5·7	− 1·9	+ 6·0
Italy	3·8	4·1	3·7	− 0·1	− 0·2
Sweden	2·6	2·9	2·7	+ 0·1	+ 1·7
	100·0	100·0	100·0	0	0

A few general observations are in order. One cannot fail to notice the dominant position of the United States as world exporter of manufactures in the post-war years. Her tremendous gain in the share of world exports in the immediate post-war years appears to have occurred basically at the expense of Germany. However, the United States has maintained all her gains till 1956, despite the sharp rise in Germany's share between the years 1950 and 1956. The tendency of Germany's share to fall at first and then to rise is paralleled only by that of Japan, a country which shared the former's fate in the last war. However, it is noticeable that Japan's effort at recapturing world markets is much slower. On the other hand, Germany still has a long way to go to recover her pre-war position as an exporter of manufactures in the world.

It seems that what these two countries gained since 1950, the United Kingdom lost, the share of the latter dropping from about 27 per cent to less than 20 per cent, a figure which is below the 23·6 per cent for 1937. France's pattern resembles that of the United Kingdom, but her share in 1956 is nonetheless above that of 1937. The other four countries, finally, show only small changes in their shares of world exports between these two years and their position has generally remained the same.

A meaningful comparison of the over-all trends between the 1899–1937 and 1937–1956 periods is not easy and may be impossible. This is because of : (*a*) the unevenness of the length of both periods, (*b*) the arbitrariness in selection of the terminal points as well as of the pivot-year 1937, and (*c*) the diverse effects of World War II on these countries.

Probably the only observation which can safely be made is that the United States has continually grown in importance since the turn of the century as exporter of manufactured commodities in the world and that this happened, more or less, at the expense of the United Kingdom.

This completes the introductory section. The next two sections present the changes which took place in the patterns of world exports of manufactured commodities between the years 1937 and 1956 and take up the search for their causes. This is done in such a way as to help to answer the question : " Why did the shares of the nine countries change in the fashion indicated in Table 2 ? "[1]

[1]The study of the changes in world trade in terms of the shares of the principal exporting countries is only one of several possible approaches. It was used by various writers on the subject and among others by A. K. Cairncross (" World Trade in Manufactures Since 1900," *Economia Internazionale*, Vol. VIII, No. 4, Nov. 1955) and by R. E. Baldwin (" The Commodity Composition of Trade : Selected Industrial Countries, 1900–1954," *The Review of Economics and Statistics*, Vol. XL, No. 1, Part 2, Supplement : February 1958).

For the purposes of this analysis the observed changes may be conveniently split up into two parts :[1] (*a*) the change in the share of a country in world exports of each individual commodity (denoted henceforth as " change in competitive position " or, alternatively, as " change in competition ") and (*b*) the change in the relative importance of each commodity in world exports (referred to hence as " change in structure ").

Section IV deals with the question of the permanency of these changes as related to the problem of restoration of pre-war patterns of world exports and final conclusions are listed in Section V.

II

Background information for a discussion of changing competitive position of the nine countries is provided in Tables 3, 4 and 5 which show, for each of them, the dollar value of exports of the seventeen commodity groups in the years 1937, 1950 and 1956, respectively, and in Table 6 which shows the corresponding percentage figures.

[1]The supporting mathematical argument can be presented as follows : If S_i is the share of commodity i in world trade and S_j the share of country j in world trade, then we can write $S_j = \sum_i s_{ij} S_i$, where s_{ij} is the share of country j in world exports of commodity i.
Differentiating, we get :

$$dS_j = \sum_i (ds_{ij} S_i + s_{ij} dS_i + ds_{ij} dS_i)$$

The first term represents changes in the shares of country j in exports of individual commodities, the second changes in the importance of individual commodities in world trade, and the third the interaction (or correlation) between the first and second terms.
Thus, the total change in the share of country j in world trade is seen to be the sum of two factors (competition and structure) and the interaction of the two.
The procedure of isolating the effects of the two factors was first suggested by Tyszynski (*op. cit.*) and was subsequently utilized by I. Svennilson, (*Growth and Stagnation in the European Economy*, Geneva, United Nations, 1954) and R. E. Baldwin (*op. cit.*). Professor G. Haberler is critical of this procedure and in his words " a distinction of just two factors, ' structure ' and ' competition,' which between them are said to account exhaustively for the total change of a country's share in world trade is insufficient " (*The Review of Economics and Statistics*, Vol. XL, No. 1, Part 2, Supplement : February 1958, p. 4).

TABLE 3

EXPORTS OF MANUFACTURED COMMODITIES, 1937*

(in thousands of dollars)

1937	C.G. 1	C.G.2	C.G.3	C.G.4	C.G.5	C.G.6	C.G.7	C.G.8	C.G.9	C.G.10	C.G.11	C.G.12	C.G.13	C.G.14	C.G.15	C.G.16	C.G.17	Total
U.S.A. ...	201,631	102,556	129,364	26,660	74,432	296,063	118,007	74,660	27,283	414,357	14,240	59,288	24,653	96,786	62,699	22,334	5,286	1,750,299
U.K. ...	176,360	63,347	141,255	36,465	79,411	207,821	94,408	15,975	61,745	146,343	95,149	602,134	63,728	99,634	65,651	51,733	4,504	2,005,663
Germany...	192,617	47,318	290,753	60,371	123,733	289,191	125,433	20,015	64,885	99,837	8,811	155,530	62,398	282,570	99,748	77,918	2,052	2,003,180
France ...	76,158	12,687	86,749	12,588	43,318	27,688	10,611	2,517	10,932	43,659	47,782	116,089	18,423	19,323	29,221	11,075	1,528	570,348
Belgium ...	136,242	85,562	47,194	33,305	23,041	16,920	14,319	682	17,597	16,722	1,375	90,165	11,283	17,483	9,844	4,321	25	526,080
Canada ...	10,358	142,047	21,528	831	143,238	9,533	7,753	10,937	1,646	38,966	19,046	5,948	14,111	9,454	6,477	1,731	425	444,029
Japan ...	28,287	6,546	25,903	12,020	23,253	26,225	16,020	430	12,949	14,680	3,812	325,774	63,886	29,335	21,562	32,064	2,260	645,006
Italy ...	6,972	5,399	17,755	9,028	8,193	13,285	4,969	766	2,892	51,481	19,965	137,008	20,761	8,366	7,664	9,864	—	324,368
Sweden ...	45,043	7,145	9,953	4,816	49,399	42,067	16,742	3,664	15,540	6,042	35	4,336	1,543	14,606	1,577	841	35	223,384
Total ...	873,668	472,607	770,454	196,084	568,018	928,793	408,262	129,646	215,469	832,087	210,215	1,496,272	280,786	577,557	304,443	211,881	16,115	8,492,357

Source : H. Tyszynski : *Op. cit.*, Table IV, p. 280

*The pounds were converted into dollars at the rate of £1 = $ 4·94436

TABLE 4

EXPORTS OF MANUFACTURED COMMODITIES, 1950*
(in thousands of dollars)

1950	C.G.1	C.G.2	C.G.3	C.G.4	C.G.5	C.G.6	C.G.7	C.G.8	C.G.9
U.S.A. ...	417,393	109,805	667,120	106,702	212,576	1,181,832	416,237	357,311	189,294
U.K. ...	271,412	165,595	333,444	108,357	158,446	722,548	394,615	126,426	234,828
Germany...	224,496	76,815	214,018	41,028	35,185	235,984	72,932	44,820	31,618
France ...	283,052	36,943	202,678	53,883	106,103	163,901	85,103	19,748	61,970
Belgium ...	267,162	160,345	139,289	55,244	24,388	64,548	46,833	2,254	39,967
Canada ...	46,682	286,936	85,879	39,298	493,581	26,606	16,162	82,452	36,243
Japan ...	73,368	57,338	15,663	13,227	8,316	21,580	11,225	476	27,742
Italy ...	24,699	12,552	32,091	14,610	14,216	93,794	32,575	8,529	29,498
Sweden ...	51,512	11,889	26,645	9,288	136,035	130,183	40,802	8,338	72,722
Total ...	1,659,776	918,218	1,716,827	441,637	1,188,846	2,640,976	1,116,484	650,354	723,882

Source : H. Tyszynski, *op. cit.*, Table V, p. 281
*The rate of exchange used for conversion of pounds into dollars was £1 = $ 2·80

TABLE 5

EXPORTS OF MANUFACTURED COMMODITIES, 1956
(in thousands of dollars)

1956	C.G.1	C.G.2	C.G.3	C.G.4	C.G.5	C.G.6	C.G.7	C.G.8	C.G.9
U.S.A. ...	827,295	301,465	1,272,844	194,682	274,576	2,335,938	947,869	516,342	282,690
U.K. ...	485,198	404,633	684,674	188,957	187,920	1,204,164	608,326	205,828	388,851
Germany	658,647	218,705	777,681	176,072	134,774	1,300,893	543,256	142,898	279,034
France ...	681,330	45,751	367,002	82,276	130,397	255,561	136,513	22,032	119,669
Belgium ...	791,646	297,161	204,899	126,712	49,748	111,482	97,520	6,501	66,772
Canada ...	78,607	639,194	270,812	18,021	835,525	86,785	33,811	73,414	23,745
Japan ...	223,407	50,894	106,682	114,565	85,030	115,130	50,818	1,391	288,626
Italy ...	112,492	25,002	151,893	29,672	38,954	213,339	42,623	11,516	28,872
Sweden ...	129,414	43,569	50,751	13,800	225,813	198,775	73,756	20,077	103,002
Total ...	3,988,036	2,026,374	3,887,238	944,757	1,962,737	5,822,067	2,534,492	999,999	1,581,261

Source : Own compilations from United Nations, *op. cit.*

C.G.10	C.G.11	C.G.12	C.G.13	C.G.14	C.G.15	C.G.16	C.G.17	Total
1,141,876	55,468	385,554	110,012	306,337	170,808	70,048	122,436	6,020,809
844,194	140,389	979,787	133,806	268,016	126,431	152,384	21,568	5,182,246
110,690	4,497	91,921	7,045	176,271	68,967	44,089	50	1,480,426
190,478	110,762	518,062	75,830	102,427	60,561	46,071	1,375	2,118,947
23,184	4,166	267,540	29,492	38,604	24,156	8,011	—	1,195,183
51,318	40,062	15,884	7,714	12,785	7,493	2,016	3,662	1,254,773
8,100	549	332,993	26,396	32,290	22,912	34,084	1,056	687,315
54,222	20,364	356,118	32,124	23,537	17,114	17,506	20	783,569
13,863	703	8,403	3,525	32,973	3,665	4,054	5,813	560,413
2,437,925	376,960	2,956,262	425,944	993,240	502,107	378,263	155,980	19,283,681

C.G.10	C.G.11	C.G.12	C.G.13	C.G.14	C.G.15	C.G.16	C.G.17	Total
2,694,921	72,509	452,725	112,917	551,113	202,496	719,151	197,354	11,956,887
1,138,291	218,458	826,804	133,301	438,035	138,179	159,674	144,145	7,555,438
752,102	22,566	299,946	98,374	616,463	89,508	224,658	8,026	6,343,603
317,900	176,999	418,247	102,370	172,410	71,550	89,098	2,671	3,191,776
96,355	5,702	320,653	49,992	95,061	58,820	159,632	27,551	2,566,207
115,859	74,008	13,449	8,580	23,608	11,950	10,725	1,023	2,319,116
49,793	1,970	693,346	132,911	116,229	9,055	142,558	868	2,183,273
180,900	38,093	299,555	70,755	62,842	21,568	69,560	11,427	1,409,063
57,738	456	14,944	4,105	82,664	3,710	23,500	15,322	1,061,396
5,403,859	610,761	3,339,669	713,305	2,158,425	606,836	1,598,556	408,387	38,586,759

TABLE 6

SHARE OF THE NINE COUNTRIES IN EACH OF THE SEVENTEEN COMMODITY GROUPS IN 1937, 1950 AND 1956

		C.G.1	C.G.2	C.G.3	C.G.4	C.G.5	C.G.6	C.G.7	C.G.8
U.S.A.	1937	23·1	21·7	16·8	13·6	13·1	31·9	28·9	57·6
	1950	25·1	12·0	38·9	24·2	17·9	44·8	37·3	54·9
	1956	20·7	14·9	32·8	20·6	14·0	40·1	37·4	51·6
U.K.	1937	20·2	13·4	18·3	18·6	14·0	22·4	23·1	12·3
	1950	16·4	18·0	19·4	24·5	13·3	27·4	35·4	19·4
	1956	12·2	20·0	17·6	20·0	9·6	20·7	24·0	20·6
Germany	1937	22·0	10·0	37·7	30·8	21·8	31·2	30·8	15·5
	1950	13·5	8·4	12·5	9·3	3·0	8·9	6·5	6·9
	1956	16·5	10·8	20·0	18·6	6·9	22·3	21·4	14·3
France	1937	8·7	2·7	11·3	6·4	7·6	3·0	2·6	2·0
	1950	17·1	4·0	11·8	12·2	8·9	6·2	7·6	3·0
	1956	17·1	2·3	9·4	8·7	6·6	4·4	5·4	2·2
Belgium	1937	15·6	18·1	6·1	17·0	4·1	1·8	3·5	0·5
	1950	16·1	17·5	8·1	12·5	2·1	2·4	4·2	0·4
	1956	19·9	14·7	5·3	13·4	2·5	1·9	3·9	0·7
Canada	1937	1·2	30·1	2·8	0·4	25·2	1·0	1·9	8·4
	1950	2·8	31·2	5·0	8·9	41·5	1·0	1·4	12·7
	1956	2·0	31·5	7·0	1·9	42·6	1·5	1·3	7·3
Japan	1937	3·2	1·4	3·4	6·1	4·1	2·8	3·9	0·3
	1950	4·4	6·2	0·9	3·0	0·7	0·8	1·0	0·1
	1956	5·6	2·5	2·7	12·1	4·3	2·0	2·0	0·1
Italy	1937	0·8	1·1	2·3	4·6	1·4	1·4	1·2	0·6
	1950	1·5	1·4	1·9	3·3	1·2	3·6	2·9	1·3
	1956	2·8	1·2	3·9	3·2	2·0	3·7	1·7	1·2
Sweden	1937	5·2	1·5	1·3	2·5	8·7	4·5	4·1	2·8
	1950	3·1	1·3	1·5	2·1	11·4	4·9	3·7	1·3
	1956	3·2	2·1	1·3	1·5	11·5	3·4	2·9	2·0
Total	1937	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100 0
	1950	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
	1956	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

C.G.9	C.G.10	C.G.11	C.G.12	C.G.13	C.G.14	C.G.15	C.G.16	C.G.17
12·7	49·8	6·8	4·0	8·8	16·8	20·6	10·6	32·8
26·2	46·8	14·7	13·0	25·8	30·8	34·0	18·5	78·5
17·9	49·9	11·9	13·5	15·8	25·5	33·4	45·0	48·3
28·6	17·6	45·3	40·2	22·7	17·3	21·6	24·4	28·0
32·4	34·6	37·2	33·1	31·4	27·0	25·2	40·3	13·8
24·6	21·1	35·8	24·8	18·7	20·3	22·8	10·0	35·3
30·1	12·0	4·2	10·4	22·2	48·9	32·8	36·8	12·7
4·4	4·6	1·2	3·1	1·7	17·7	13·7	11·7	—
17·6	13·9	3·7	9·0	13·8	28·6	14·7	14·1	2·0
5·1	5·2	22·7	7·8	6·6	3·3	9·6	5·2	9·5
8·6	7·8	29·4	17·5	17·8	10·3	12·1	12·2	0·9
7·6	5·9	29·0	12·5	14·4	8·0	11·8	5·6	0·7
8·2	2·0	0·6	6·0	4·0	3·0	3·2	2·0	0·2
5·5	1·0	1·1	9·1	6·9	3·9	4·8	2·1	—
4·2	1·8	0·9	9·6	7·0	4·4	9·7	10·0	6·7
0·8	4·7	9·1	0·4	5·0	1·6	2·1	0·8	2·6
5·0	2·1	10·6	0·5	1·8	1·3	1·5	0·5	2·4
1·5	2·1	12·1	0·4	1·2	1·1	2·0	0·7	0·2
6·0	1·8	1·8	21·8	22·8	5·1	7·1	15·1	14·0
3·8	0·3	0·2	11·3	6·2	3·3	4·6	9·0	0·7
18·3	0·9	0·3	20·8	18·6	5·4	1·5	8·9	0·2
1·3	6·2	9·5	9·1	7·4	1·5	2·5	4·7	—
4·1	2·2	5·4	12·1	7·6	2·4	3·4	4·6	—
1·8	3·3	6·2	9·0	9·9	2·9	3·5	4·3	2·8
7·2	0·7	—	0·3	0·5	2·5	0·5	0·4	0·2
10·0	0·6	0·2	0·3	0·8	3·3	0·7	1·1	3·7
6·5	1·1	0·1	0·4	0·6	3·8	0·6	1·4	3·8
100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

These four tables reflect the varying fortunes of the nine countries as far as their competitive power is concerned. Thus, as Table 6 shows the shares of some of them underwent changes of 10 per cent, or more, in several commodity groups in the period 1937–1956.

For example, there was a substantial increase in the share of the United States in Commodity Groups 3 (Chemicals), 15 (Books, Films, Cameras, Etc.), and 16 (Finished Goods,[1] N.E.S.), all at the expense of Germany. Canada's and Japan's shares also rose at the expense of Germany; Canada's in Commodity Group 5 (Miscellaneous Materials)[2] and Japan's in Commodity Group 9 (Railways, Ships, Etc.).[3] The declines of the United Kingdom's share, on the other hand, were particularly striking in Commodity Group 1 (Iron and Steel), 11 (Alcoholic Beverages, Tobacco Mfs.), and 12 (Textiles). It is interesting to note that, on the contrary, France's share rose in all these three commodity groups quite substantially and that the same holds true for the United States' share as far as the last two mentioned commodity groups are concerned.

On the whole:

1. U.S.A. improved her share in 14 and worsened in 3 commodity groups,
2. France improved her share in 13 and worsened in 4 commodity groups,
3. Italy improved her share in 12 and worsened in 5 commodity groups.
4. Belgium improved her share in 11 and worsened in 6 commodity groups,
5. Sweden* improved her share in 10 and worsened in 6 commodity groups,
6. Canada* improved her share in 8 and worsened in 8 commodity groups,
7. U.K. improved her share in 8 and worsened in 9 commodity groups,
8. Japan improved her share in 6 and worsened in 11 commodity groups,
9. Germany improved her share in 2 and worsened in 15 commodity groups,

* no change in one instance.

Despite the fact that this summary table does provide a good tentative indication of the changing competitive position of each country in the period under study, one cannot, of course, draw any definite conclusions from it, simply because it is impossible to

[1] On account of the mixed composition of Commodity Group 16, it is not possible to identify more closely the specific commodities involved.

[2] Particular mention should be made here of Germany's decline in exports of leather, leather goods, wood, and paper products.

[3] The change in Japan's share is basically attributable to the growth of the shipbuilding industry. In fact, Japan is now the second largest shipbuilding country in the world.

attribute much importance to the minor, plus or minus, changes shown in Table 6. In addition, our prime concern is with the *over-all* change in the competitive position of each country, rather than with the change in particular commodity groups, and this summary table cannot be of much help in that respect.

Therefore, the special procedure suggested by Tyszynski is adopted. It involves (*a*) computing hypothetical total export figures, and then shares, for each country for the year 1956 on the assumption that while the value and the structure of world exports changed, each country succeeded in maintaining the competitive position in each individual commodity group that it occupied in the year 1937, and (*b*) establishing the differences between these hypothetical and actual 1956 shares.

The outcome of this investigation is as follows :[1]

Country	Actual Share 1956	Hypothetical Share 1956	Competitive Effect
U.S.A.	31·0%	24·6%	+6·4%
U.K.	19·6	21·9	−2·3
Germany	16·4	24·8	−8·4
France	8·3	6·1	+2·2
Belgium	6·6	5·8	+0·8
Canada	6·0	4·9	+1·1
Japan	5·7	5·8	−0·1
Italy	3·7	3·2	+0·5
Sweden	2·7	2·9	−0·2
	100·0	100·0	0

[1] In terms of the notation given in footnote, page 116, the actual 1956 share is $\sum_i (s_{ij}+ds_{ij})\,(S_i+dS_i)$, while the hypothetical share is $\sum_i s_{ij}\,(S_i+dS_i)$. Thus the difference between the two is $\sum_i ds_{ij}\,(S_i+dS_i)$, or a weighted average of the changes of the *j*th country's shares of the individual commodity groups, using as weights the shares of the commodity groups in world trade in 1956. An alternative approach, using 1937 weights, would give the competitive effect as $\sum_i ds_{ij}S_i$, but the picture would be substantially the same because, as we shall see, the interaction effect $\sum_i ds_{ij}dS_i$ was for most countries small over the period studied.

We may conclude that the United States, France, Canada, Belgium, and Italy improved their over-all competitive position since 1937, apparently at the expense of two countries, the United Kingdom and particularly Germany.[1]

III.

This section is devoted to the study of the effects of changes in structure, or what amounts to the same, the study of the effects of changes in the relative importance of the individual commodity groups in world trade on the shares of the nine countries.

One approach to the discussion of this subject is the distinction between three categories of commodity groups, namely, " expanding," " stable," and " declining." It is immediately clear, however, that the allocation of the individual commodity groups among these three categories is not an easy project, because one has first to decide on a criterion by means of which the classification of the commodity groups could be achieved. Thus, even if we could agree[2] that the so-called " per cent increase, or decrease, in the share of world exports per annum " is the proper criterion to be used, there still are two other decisions to be made : (*a*) how to determine the " breaking points " which would separate the " expanding " from the " stable," and the " stable " from the " declining " groups, and (*b*) what span of time should be used, that is, should a long-term or a short-term trend[3] be applied as criterion ?

Fortunately, as Table 7 plainly evidences, there is little difficulty with the so-called " breaking points," if the short-term trend is used.

[1]It is imperative to bear constantly in mind that in an analysis such as this, a country's share could have increased simply because some other country's share has declined and vice versa.

[2]This writer is well aware of the fact that many objections can be voiced to the determining of the slope of a line by means of dividing the difference between two terminal points by the time interval. The more appropriate procedure (such as that used in the semi-averages method) is, unfortunately, impossible in this case.

[3]By the term " long-term trend " is understood here the annual amount of increase, or decrease, computed for the period 1899–1956. The " short-term trend " implies the same for the period 1937–1956. It so happens that the lengths of the periods stand to each other in relation of three to one.

TABLE 7—SHARE OF TOTAL EXPORTS HELD BY EACH COMMODITY GROUP, IN SELECTED YEARS, 1899–1956

m. oup	Name	Share in : 1899	1913	1929	1937	1950	1956	Short-term trend 1937–1956	Design. acc. to ST trend	Long-term trend 1899–1956	Design. acc. to LT trend	Tysz. trend 1899–1950	Tysz. design-ation
6	Industrial Equipment	6·4	8·1	9·2	10·9	13·7	15·1	+0·221	E	+0·153	E	+0·140	E
10	Motor-Cars, Airc., Etc.	0·4	3·4	8·8	10·0	12·6	14·0	+0·211	E	+0·239	E	+0·232	E
7	Electrical Goods	0·8	2·4	3·8	4·8	5·8	6·6	+0·095	E	+0·102	E	+0·094	E
6	Finished Goods, N.E.S.	4·9	3·9	3·2	2·4	2·0	4·1	+0·089	E	−0·014	S	−0·055	D
9	Railways, Ships, Etc.	4·5	3·9	2·9	2·5	3·7	4·1	+0·084	E	−0·007	S	−0·022	D
8	Agric. Equipment	1·0	1·3	1·8	1·5	3·4	2·6	+0·058	E	+0·028	E	+0·036	E
3	Chemicals and Al. Pr.	8·3	8·3	7·9	9·1	8·9	10·1	+0·053	E	+0·032	E	+0·017	S
4	Non-Metal. Materials	2·7	2·4	2·7	2·3	2·3	2·4	+0·005	S	−0·005	S	−0·006	S
1	Iron and Steel	6·3	8·1	8·1	10·3	8·6	10·3	0	S	+0·070	E	+0·050	E
2	Non-Ferrous Metals	4·9	5·7	4·5	5·5	4·8	5·3	−0·011	S	+0·007	S	0	S
11	Alcoh. Bev., Tobacco Mfs. ...	3·7	2·4	2·3	2·5	2·0	1·6	−0·047	D	−0·037	D	−0·026	D
14	Metal Manuf., N.E.S.	7·1	6·2	5·8	6·8	5·1	5·6	−0·063	D	−0·026	D	−0·021	D
3	Apparel	7·2	6·5	5·5	3·3	2·2	1·8	−0·079	D	−0·095	D	−0·096	D
5	Misc. Materials	5·7	6·2	7·1	6·7	6·2	5·1	−0·084	D	−0·011	S	+0·011	S
.5	Books, Films, Etc.	3·9	3·8	3·6	3·6	2·6	1·5	−0·111	D	−0·042	D	−0·019	S
2	Textiles	31·5	26·7	22·5	17·6	15·3	8·7	−0·468	D	−0·400	D	−0·333	D
7	Not Classified	0·7	0·7	0·3	0·2	0·8	1·1						
		100·0	100·0	100·0	100·0	100·0	100·0						

E = expanding S = stable D = declining

Source : The figures for the years 1899 through 1950 are based on those given by Tyszynski (*op. cit.*,) in Tables I—V. They differ from those given by him in Table VII, because the exports of Switzerland and India were not taken into account. The 1956 figures were compiled by this writer from United Nations, *Commodity Trade Statistics*, 1956.

As Table 7 illustrates, seven commodity groups (3, 6, 7, 8, 9, 10 and 16) are characterized by a rising short-term trend and are accordingly classified as " expanding," three commodity groups (1, 2, and 4) are classified as " stable " since their share was approximately the same in 1956 as in 1937,[1] and all the remaining commodity groups (5, 11, 12, 13, 14 and 15) fall into the " declining " category.

Most noticeable is the shift towards finished capital goods[2] and away from such consumer goods as textiles, apparel, books and films in the post-war period. This, one should add, is not a new development, for as Table 7 shows such a tendency was in existence since at least 1899, if not an earlier date.

Given the classification of commodities by the expanding, stable, and declining categories, it becomes possible to demonstrate how the nine countries adapted their exports to the changing importance of the commodity groups. We form for this purpose Table 8 on the basis[3] of Tables 3 and 5, expressing each country's figures as percentages of its total exports.

[1]The limits of $\pm$ 0·020 used for that particular category are obviously entirely arbitrary.

[2]According to one authoritative source, this tendency was very pronounced in1956, when " capital goods mainly accounted for the increase in total exports of manufactures " (p. 87), while " there was a further fall in the share which consumer goods have in total exports of manufactures (p. 77) (G.A.T.T. : *International Trade* 1956, Geneva, June 1957).

[3]It would have been no doubt better if we could use tables showing volume figures instead of Tables 3 and 5 as basis for Table 8. However, this is not possible in view of the mixed composition of each commodity group. Professor A. K. Cairncross, writing in a similar context, justified the desirability of volume figures by pointing out that " a transfer of resources to an expanding group of manufactures may be accompanied by a fall in their price and so be concealed in statistics of value " (*op. cit.*, p. 731).

TABLE 8

PERCENTAGE DISTRIBUTION OF EXPORTS OF THE NINE COUNTRIES, BY COMMODITY GROUPS, 1937 AND 1956

1937	C.G.1	C.G.2	C.G.3	C.G.4	C.G.5	C.G.6	C.G.7	C.G.8	C.G.9
U.S.A. ...	11·5	5·9	7·4	1·5	4·2	16·9	6·7	4·3	1·6
U.K. ...	8·8	3·1	7·0	1·8	4·0	10·4	4·7	0·8	3·1
Germany	9·6	2·4	14·5	3·0	6·2	14·4	6·3	1·0	3·2
France ...	13·3	2·2	15·2	2·2	7·6	4·9	1·9	0·4	1·9
Belgium ...	25·9	16·3	9·0	6·3	4·4	3·2	2·7	0·1	3·3
Canada ...	2·3	32·0	4·8	0·2	32·3	2·1	1·7	2·5	0·4
Japan ...	4·4	1·0	4·0	1·9	3·6	4·1	2·5	0·1	2·0
Italy ...	2·1	1·7	5·5	2·8	2·5	4·1	1·5	0·2	0·9
Sweden ...	20·2	3·2	4·5	2·2	22·1	18·8	7·5	1·6	7·0
World ...	10·3	5·5	9·1	2·3	6·7	10·9	4·8	1·5	2·5
1956	**C.G.1**	**C.G.2**	**C.G.3**	**C.G.4**	**C.G.5**	**C.G.6**	**C.G.7**	**C.G.8**	**C.G.9**
U.S.A. ...	6·9	2·5	10·7	1·6	2·3	19·5	7·9	4·3	2·4
U.K. ...	6·4	5·4	9·1	2·5	2·5	15·9	8·1	2·7	5·1
Germany	10·4	3·4	12·3	2·8	2·1	20·5	8·6	2·3	4·4
France ...	21·3	1·4	11·5	2·6	4·1	8·0	4·3	0·7	3·7
Belgium ...	30·9	11·6	8·0	4·9	1·9	4·3	3·8	0·3	2·6
Canada ...	3·4	27·5	11·7	0·8	36·0	3·7	1·5	3·2	1·0
Japan ...	10·2	2·3	4·9	5·3	3·9	5·3	2·3	0·1	13·2
Italy ...	8·0	1·8	10·8	2·1	2·8	15·1	3·0	0·8	2·1
Sweden ...	12·2	4·1	4·8	1·3	21·3	18·7	7·0	1·9	9·7
World ...	10·3	5·3	10·1	2·4	5·1	15·1	6·6	2·6	4·1

C.G.10	C.G.11	C.G.12	C.G.13	C.G.14	C.G.15	C.G.16	C.G.17	Total
23·7	0·8	3·4	1·4	5·5	3·6	1·3	0·3	100·0
7·3	4·7	30·0	3·2	5·0	3·3	2·6	0·2	100·0
5·0	0·4	7·8	3·1	14·1	5·0	3·9	0·1	100·0
7·7	8·4	20·4	3·2	3·4	5·1	1·9	0·3	100·0
3·2	0·3	17·1	2·2	3·3	1·9	0·8	0·0	100·0
8·8	4·3	1·3	3·2	2·1	1·5	0·4	0·1	100·0
2·3	0·6	50·5	9·9	4·5	3·3	5·0	0·3	100·0
15·9	6·2	42·2	6 4	2·6	2·4	3·0	0·0	100·0
2·7	0·0	1·9	0·7	6·5	0·7	0·4	0·0	100·0
10·0	2·5	17·6	3·3	6·8	3·6	2·4	0·2	100·0

C.G.10	C.G.11	C.G.12	C.G.13	C.G.14	C.G.15	C.G.16	C.G.17	Total
22·5	0·6	3·8	1·0	4·6	1·7	6·0	1·7	100·0
15·1	2·9	10·9	1·8	5·8	1·8	2·1	1·9	100·0
11·9	0·4	4·7	1·5	9·7	1·4	3·5	0·1	100·0
10·0	5·6	13·1	3·2	5·4	2·2	2·8	0·1	100·0
3·8	0·2	12·5	1·9	3·7	2·3	6·2	1·1	100·0
5·0	3·2	0·6	0·4	1·0	0·5	0·5	0·0	100·0
2·3	0·1	31·8	6·1	5·3	0·4	6·5	0·0	100·0
12·8	2·7	21·3	5·0	4·5	1·5	4·9	0·8	100·0
5·4	0·0	1·4	0·4	7·8	0·4	2·2	1·4	100·0
14·0	1·6	8·7	1·8	5·6	1·5	4·1	1·1	100·0

The analysis of Table 8 leads to the following summary table, showing, for each country, those commodity groups which represented at least 10 per cent of the value of total exports in 1937 and 1956.

Country	Commodity Groups						
	1937			1956			
United States	1	6	10*	3	6	10*	
United Kingdom	6	12*		6	10	12	
Germany	3	6	14	1	3	6*	10
France	1	3	12*	1*	3	10	12
Belgium	1*	2	12	1*	2	12	
Canada	2*	5*		2*	3	5*	
Japan	12*			1	9	12*	
Italy	10	12*		3	6	10	12*
Sweden	1*	5*	6	1	5*	6	

Note : Exports of commodity groups marked * represented a value in excess of 20 per cent of total exports.

Two general observations[1] can be made :

(1) Each country normally has two or three commodity groups which together account for 50 per cent, or more, of the total value of its exports of manufactured commodities.[2]

It can be pointed out in this connection that five countries had not, even in 1956, wholly shaken off their 1937 dependence on exports of textiles ; this is particularly true of Japan and Italy. The exports of iron and steel are very important to Belgium, France, Germany, Japan and Sweden. The exports of chemicals, industrial equipment, and motor-cars form a high proportion of total exports of such countries as the United

[1]It is interesting to point out that for most countries the groupings for 1956 exceed those for 1937.

[2]The only exception is the United Kingdom with approximately 40 per cent of total value accounted for by the leading commodity groups shown in the summary table.

States, Germany, and Italy. This is also true in the case of the United Kingdom, except that the exports of textiles take the place of chemicals on the list of major export items.

(2) Each country, except Belgium and Sweden, experienced some change in the composition of its leading commodities between 1937 and 1956, which tended generally to narrow the 1937 differences in export structure between the countries.

Among the most noticeable changes are the increasing relative importance of exports of: motor-cars and aircraft for the United Kingdom, France, and Sweden[1] and of motor-cars solely for Germany; of chemicals for the United States, Canada, and Italy; of iron and steel for France, Japan, Belgium,[1] and Italy[1]; of ships for Japan; and of industrial equipment for Germany, the United Kingdom[1] and Italy. Among the declines, the most pronounced tendency is the declining relative importance of exports of textiles for the United Kingdom, France, Italy,[1] Japan[1] and Belgium[1]; of iron and steel for the United States and Sweden; and of metal manufactures (essentially instruments) for Germany.

Table 9, obtained by consolidating the commodity groups according to the classification established in Table 7, throws additional light on this topic. It shows for each country both the percentage distribution of the exports according to the expanding, stable, and declining categories, and the change in each percentage figure between the years 1937 and 1956.

Unfortunately, neither Table 8 nor Table 9 can help us much in establishing the over-all effect of changing importance of various commodity groups on the share of world exports of the individual countries.

This can be accomplished, however, by using the special procedure which previously permitted us to compute the

[1]The conclusion regarding these countries was derived directly from Table 8 rather than from the summary table.

TABLE 9.

EXPORTS OF MANUFACTURED COMMODITIES, BY SPECIAL CATEGORIES, 1937 AND 1956
(in percentages)

		Categories of Commodity Groups				
		Expanding	Stable	Declining	Not Classified	Total
U.S.A.	1937	61·9	18·9	18·9	0·3	100·0
	1956	73·3	11·0	14·0	1·7	100·0
	Change	+11·4	− 7·9	− 4·9	+1·4	0
U.K.	1937	35·9	13·7	50·2	0·2	100·0
	1956	58·1	14·3	25·7	1·9	100·0
	Change	+22·2	+ 0·6	−24·5	+1·7	0
Germany	1937	48·3	15·0	36·6	0·1	100·0
	1956	63·5	16·6	19·8	0·1	100·0
	Change	+15·2	+ 1·6	−16·8	0	0
France	1937	33·9	17·7	48·1	0·3	100·0
	1956	41·0	25·3	33·6	0·1	100·0
	Change	+ 7·1	+ 7·6	−14·5	− 0·2	0
Belgium	1937	22·3	48·5	29·2	0	100·0
	1956	29·0	47·4	22·5	1·1	100·0
	Change	+ 6·7	− 1·1	− 6·7	+1·1	0
Canada	1937	20·7	34·5	44·7	0·1	100·0
	1956	26·6	31·7	41·7	0	100·0
	Change	+ 5·9	− 2·8	− 3·0	−0·1	0
Japan	1937	20·0	7·3	72·4	0·3	100·0
	1956	34·6	17·8	47·6	0	100·0
	Change	+14·6	+10·5	−24·8	−0·3	0
Italy	1937	31·1	6·6	62·3	0	100·0
	1956	49·5	11·9	37·8	0·8	100·0
	Change	+18·4	+ 5·3	−24·5	+0·8	0
Sweden	1937	42·5	25·6	31·9	0	100·0
	1956	49·7	17·6	31·3	1·4	100·0
	Change	+ 7·2	− 8·0	− 0·6	+1·4	0
World	1937	41·2	18·1	40·5	0·2	100·0
	1956	56·6	18·0	24·3	1·1	100·0
	Change	+15·4	− 0·1	−16·2	+0·9	0

competitive effect. Again, we could get two results,[1] depending on whether we used the 1956 or the 1937 shares as weights.

Using 1956 weights we get the following picture.

Country	Change in Share of World Exports 1937–1956 (from Table 2) (1)	Competitive Effect (from Section II) (2)	Structural Effect (1956 weights) (3)	Interaction[2] (4)= (1)—(2)—(3)
U.S.A. ...	+10·4	+6·4	+4·0	0
U.K.	− 4·0	−2·3	−0·3	−1·4
Germany ...	− 7·2	−8·4	+0·9	+0·3
France ...	+ 1·6	+2·2	−1·1	+0·5
Belgium ...	+ 0·4	+0·8	−0·8	+0·4
Canada ...	+ 0·7	+1·1	−0·6	+0·2
Japan ...	− 1·9	−0·1	−1·6	−0·2
Italy	− 0·1	+0·5	−0·6	0
Sweden ...	+ 0·1	−0·2	+0·1	+0·2

The effect of the structural change is found to have been relatively favourable to the United States, Germany and Sweden and relatively unfavourable to all the other countries, particularly to Japan and France.

IV.

Having shown what impact the changes in competition and structure had on the shares of world exports of the nine leading manufacturing countries, it is quite logical to inquire whether

[1]In the notation previously explained these two measures would be respectively $\sum_i dS_i\,(s_{ij}+ds_{ij})$ and $\sum_i dS_i s_{ij}$.

[2]The interaction term $=\Sigma S_i ds_{ij}+\Sigma s_{ij}dS_i+\Sigma ds_{ij}dS_i-\Sigma ds_{ij}\,(S_i+dS_i)-\Sigma dS_i\,(s_{ij}+ds_{ij})$

$= -\Sigma dS_i ds_{ij}$

Thus a negative interaction term indicates a positive association between the extent to which a country's share in particular commodity groups has increased and the extent to which the groups themselves have increased in relative importance in world trade. The interaction terms are generally small, except for the United Kingdom.

all the observed changes indicate that the pre-war patterns have been definitely altered or that there has been a tendency towards the restoration of pre-war patterns.

Each of the preceding sections of this study already contained at least one element which pointed out in the direction of the restoration of the pre-war patterns of world exports. It is fitting to make them explicit at this point.

Thus, a glance in Table 2 (Section I) at the shares of various countries in the years 1937, 1950 and 1956 reveals that the shares of all countries, with the exception of Belgium,[1] tended to revert, after 1950, to their 1937 position ; the shares of Germany and Japan moving upward and of the others downward.

A detailed study of Table 6 (Section II) makes it apparent that the shares of each country in world exports of particular commodities in 1956 resemble more closely those of 1937 than do those of 1950. This can be demonstrated most easily on the basis of Commodity Groups 3 (Chemicals), 9 (Railways, Ships, Etc.), and 10 (Motor-Cars, Aircraft, Etc.). In each of these three cases, eight countries show an up-and-down or a down-and-up movement in the periods 1937–1950 and 1950–1956 and only one country follows a trend either upward or downward throughout the entire 1937–1956 period.

Commodity Group 10 is an ideal case in point. Witness the swings in the shares of the United States, the United Kingdom, and Germany.

	1937	1950	1956
U.S.A.	49·8	46·8	49·9
U.K.	17·6	34·6	21·1
Germany	12·0	4·6	13·9

[1]It is also true that the tendency of the United States' share to revert to its 1937 position is only slightly indicated. Nevertheless, it follows the up-and-down pattern to some extent.

This tendency is general[1] for all three categories of commodity groups, although it seems to be somewhat stronger for the most rapidly expanding commodity groups.

Table 7 (Section III) provides an additional clue. A careful comparison of the short-term and long-term trends given there, discloses how little difference it would have actually made if the long-term trend would have been used in classifying commodity groups rather than the short-term trend. Only the Commodity Groups 1 (Iron and Steel), 5 (Miscellaneous Materials), 9 (Railways, Ships, Etc.), and 16 (Finished Goods, N.E.S.) would have been differently classified. This obviously must imply that the long-range tendencies are well evident in 1956 and that the growth patterns of most all commodity groups which existed for several decades continue to exist. Best examples are: Commodity Groups 6 (Industrial Equipment), 10 (Motor-Cars, Aircraft, Etc.), and 7 (Electrical Goods) which are seen not to have changed their long-term growth patterns at all, as evidenced by their steadily rising share of world exports, and Commodity Groups 11 (Alcoholic Beverages, Tobacco Mfs.), 13 (Apparel), 15 (Books, Films, Cameras, Etc.) and 12 (Textiles), all of which are, since 1899, on a downward slide as far as their role among world exports of manufactures is concerned.

[1]It is interesting to notice the exceptions and their tendencies:

Expanding commodity groups:

3: Canada (up)
6: Canada (up); Italy (up)
7: U.S.A. (up); Canada (down); Sweden (down)
8: U.S.A. (down); U.K. (up); Japan (down)
9: Belgium (down)
10: Canada (down)
16: U.S.A. (up); Belgium (up); Japan (down); Italy (down); Sweden (up)

Stable commodity groups:

1: U.K. (down); France (up); Belgium (up); Japan (up); Italy (up)
2: U.K. (up); Belgium (down); Canada (up)
4: Italy (down)

Declining commodity groups:

5: U.K. (down); Canada (up); Sweden (up)
11: U.K. (down); Canada (up)
12: U.S.A. (up); U.K. (down); Belgium (up); Sweden (up)
13: Belgium (up); Canada (down); Italy (up)
14: Belgium (up); Canada (down); Italy (up); Sweden (up)
15: Belgium (up); Japan (down); Italy (up).

But, one might ask, " Was this tendency continued throughout, is it being re-established after having been interrupted on account of war, or has it maybe even been reversed ?"

Comparing the 1899–1937 and the 1937–1956 trends, we conclude that actually all three cases did occur. The great majority of the commodity groups (9 out of 16) maintained their long-term patterns unchanged, but, what is more important, four others reverted to them after they were altered in the immediate post-war period.[1]

The breakdown is shown below to be as follows :

Commodity Groups with a :			Difficult to tell
continuous trend	temporarily changed trend	reversed trend	
2, 4, 6, 7, 10, 11, 12, 13, 15	1, 3, 8, 14	5, 9	16

We have thus three indications that the pre-war patterns of trade were in the process of being re-established by 1956. But, before drawing a definite conclusion, it is desirable to add still one more test.

The reasoning behind this test is as follows : If the three indications are correct, then obviously the 1956 matrix (Table 5) must resemble the 1937 matrix (Table 3) more than does the 1950 matrix (Table 4). To prove that this is the case, an entirely new procedure is devised and a new concept is introduced, which this writer designates as " coefficient of stability " (S). This coefficient is designed to measure the degree of the *overall stability* of structural relationships over time.[2]

[1]The nonconformity of Commodity Groups 5, 9 and 16 to the patterns displayed by other commodity groups was already previously mentioned.

[2]The main advantage of the coefficient of stability, as this writer sees it, is that it enables us, whenever any two, or more, corresponding matrices are compared, to express *in one figure* the extent of the overall change which took place between any two, or more, years.

The procedure involves conversion[1] of all the figures[2] in each matrix into corresponding ranks.[3] If this is accomplished, another matrix is then formed to provide the differences between the corresponding ranks in the previous matrices. The sum of these differences is certainly always zero, but what we are after is the sum of the positive, *or* of the negative, differences. This sum is entered, namely, as numerator in the formula [4] for S, which is:

$$S = 1 - \frac{\frac{\Sigma|u_i - u_{i-1}|}{2}}{\frac{N^2}{4}},$$ if an even number of fields in both matrices is compared,

or:

$$S = 1 - \frac{\frac{\Sigma|u_i - u_{i-1}|}{2}}{\frac{N^2-1}{4}},$$ if an odd number of fields in both matrices is compared.

where: u_i is the rank of each entry in year "i," and
N is the total number of entries (that is, fields which are considered).

S can range from zero to one. S equals 1 when all figures in one matrix change by the same, or similar, amount in such fashion that no change in the ranks takes place. We then say that perfect stability has been maintained between the two periods. If, on the other hand, and this is a most improbable case, the largest figure in one matrix becomes the smallest one in the other, and *vice versa*, and accordingly all the ranks reverse themselves, we adjudge this situation as one of perfect instability. Normally one can expect S to lie between these two extremes.

[1]The shape of the matrix itself is no handicap whatsoever, since only the number of fields actually compared is of essence. If ties occur, they are treated as in rank correlation problems.

[2]It goes without saying that accuracy of the data is very essential for this procedure to provide a satisfactory answer, but this is not a problem peculiar to this method alone

[3]One of the advantages of a procedure which utilizes ranks is that it enables us to compare any two matrices expressed in different currency units, without the need of converting the units of one currency into the other.

[4]The "2" and "4" in the formula should not be cancelled out, since the numerator is obtained from the tables directly and makes the re-checking of the results easier.

When we interpret the coefficient of stability, we may refer to a high, medium, or low stability, as is often done in correlation analyses when one interprets the product-moment or rank coefficients[1] as to the degree of relationship they measure. The more important and interesting application of the coefficients of stability lies, however, in comparing two (or more) of them. This enables us to state in which of the periods the degree of stability is higher (or highest) and in which it is lower (or lowest).

Adopting this procedure specifically to Tables 3, 4 and 5 (found in Section II of this study), we find that the sums of the positive (and negative) differences between the ranks are : 1,387 for 1937–1950 ; 1,138 for 1950–1956 ; and 1,179 for 1937–1956.

Substituting each of these results as numerator in the formula for S (with $N=153$), we get :[2]

for 1937–1950 $S=0{\cdot}763$,

for 1950–1956 $S=0{\cdot}806$, and

for 1937–1956 $S=0{\cdot}798$

It is not surprising at all to discover that the degree of stability in the period 1950–1956 (as evidenced by a coefficient of 0·806) was greater than in the period 1937–1950, which encompassed the war years ($S=0{\cdot}763$). But the fact that the degree of stability in the entire period considered, that is 1937–1956, was greater than in the period 1937–1950 can mean only one thing and this is : the events which took place in the period

[1]A legitimate question to ask is why we need the coefficient of stability in the first place and do not use the rank correlation coefficient instead. One of the advantages of this precedure is that the formula for S permits avoiding the squaring of the differences between the ranks and hence is more time-saving than Spearman's procedure. S is also easier to compute than Kendall's " tau." In addition, the individual differences between the ranks are suitable for interpretation separately, even if one does not compute S, whereas the squares of these figures are completely meaningless and of no usable value.

[2]On the basis of tables compiled by Tyszynski (*Op. cit.*, T. I–IV, pp. 277–280), this writer was able to compute the coefficients of stability (S) for several other periods, too. The results are given below :

Period	Coefficient of Stability (S)
1899–1913	0·855
1913–1929	0·831
1929–1937	0·852
1899–1937	0·638

1950–1956 tended to restore the pre-war patterns of exports of manufactured goods.[1]

V.

Two main conclusions are reached on the basis of this study. The first is that changes in " competition " and in " structure " have both been influential in changing the distribution of world exports among the leading manufacturing countries in the period 1937–1956. Of the two effects, the competitive effect was unquestionably the stronger one. For, as the summary table on page 133 demonstrates, those countries which had a larger share of world exports in 1956 than in 1937 (U.S.A., France, Canada and Belgium), owe this to their relatively more favorable competitive position in various commodity groups.[2] The same is true with respect to the United Kingdom and Germany, as these countries' declining share can be explained by their relatively less favorable competitive position. On the other hand, the effects of changes in structure seem to have tended, in most instances, to counteract the competitive effects. This is best observed in the cases of Germany, France, Belgium, Canada, and Italy. Only in the case of Japan was the structural effect definitely the more important one.

The second conclusion is that the pre-war patterns of world exports of manufactured commodities have tended to be restored in recent years. This view is supported by several pieces of evidence. However, the data presented in this survey do not, of course, enable us to say whether this tendency back towards the pre-war pattern will continue.

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[1]A further test supporting this conclusion was carried out by studying the rank of the individual cells in the commodity-country matrices. Between 1950 and 1956 the rank of 102 cells moved in a direction opposite to that in which it had moved between 1937 and 1950, while in only 43 cases did the rank move in the same direction in the two periods. Further details of this test may be obtained from the author.

[2]Sweden is an exception.

The Periodicity and Stability of Inventory Cycles in the U.S.A.—Part I[1]

I.

The student of business fluctuations in the U.S.A. cannot fail to notice two special features. First, the existence of numerous short cycles with a period of some 2 to 4 years and second, in the period since 1919, the important part played in these short cycles by inventory investment and disinvestment. It is well known that simple macrodynamic models can be constructed in which the interaction of the marginal propensity to consume and businessmen's inventory—sales policy can lead to oscillations in the level of output and associated changes in the rate of inventory investment. The purpose of this paper is to consider whether such models are consistent with historical data from the standpoint of periodicity and stability, a matter which does not seem to have received adequate attention. This involves the construction of some new models of the inventory cycle, somewhat more involved than those hitherto presented. A summary and conclusions appear in the final section of Part II of the paper.

It will be useful to begin with an impression of the frequency and periodicity of the short cycles in the U.S.A. since 1854. The approach of the National Bureau of Economic Research is suitable for this purpose and reference is made first to their results.[2] For the period 1854 to 1938, ignoring the war years, they record 41 turning points, which yield 18 complete cycles measuring from peak to peak or 19 when measured between troughs. The following table analyses the periodicity.

[1]Part II will be published in the September issue of this Journal.

[2]The definition of the business cycle adopted by the N.B.E.R. is given in Burns and Mitchell, *Measuring Business Cycles*, p. 3, and in Mitchell, *What Happens during Business Cycles*, p. 6. Their definition does not distinguish between major and minor cycles.

DURATION OF U.S. BUSINESS CYCLES (YEARS)[1]

	2–3	3–4	4–5	5–6	6 & over	Total
Peak to Peak ...	4	8	2	2	2	18
Trough to Trough ...	4	9	1	2	3	19

It can be seen that two thirds of all cycles have a duration of 2—4 years.

For the period since 1945 N.B.E.R. reference cycle dates do not appear to have been published. The cyclical pattern is obscured by the disturbances associated with the Korean war. The Federal Reserve index of industrial production shows peaks in 1948, 1953 and 1956/7 and troughs in 1946, 1949, 1954 with a further possible trough in 1958. Thus, the postwar cycle seems to reflect again the typical 3—4 year periodicity.

The turning points (reference cycle dates) of the N.B.E.R. are decided on the evidence of clustering of turning points in individual series so that the amplitude of the cyclical movements cannot be specified except for individual series. A good representative indicator of the business cycle is provided by an index of industrial or manufacturing production. Examination of the turning points in Frickey's index of manufacturing production 1860—1913 and the Federal Reserve index for the inter-war period reveals turning points which agree closely with the N.B.E.R. dates. The production series display considerable differences in the amplitude of movements in the various short cycles, some of which are detectable in the annual figures only as a deceleration or cessation of growth (e.g. the minor cycles of 1887—90, 1890—92, between peaks, and the recession of 1926—27). It is quite arbitrary to exclude such minor cycles from the list on the grounds of smallness of amplitude, since cycles of similar duration but varying amplitude are quite consistent with a linear model of the business cycle which produces damped oscillations.[2] It is proposed, therefore, to assume that the minor

[1]From Mitchell, *op. cit.*, p. 12. The table is based on the duration of expansion and contraction phases of reference cycles in months as given by Mitchell e.g., 3—4 years includes cycles of 36—47 months.

[2]This does not imply that the cycles were so caused.

cycles which have occurred in U.S. business have a typical period of some 2—4 years.

For the period since 1919 it is well established that the turning points of minor cycles are associated with changes in inventory investment and that the changes in output in booms and recessions are accounted for substantially by changes in inventory investment. For the period 1919 to 1938 Abramovitz, using Kuznets' figures, showed that the average change in non-farm inventory investment over 5 cycles was 20 per cent of the average change in G.N.P. in expansions and 43 per cent in contractions. In comparison construction accounted for 6 per cent of the change in real G.N.P. in expansions and 11 per cent in contractions. Producer durables accounted for 14 per cent and 26 per cent respectively.[1]

For the post-war period Dept. of Commerce data shows that changes in inventory investment still accounts for substantial proportions of changes in real G.N.P. at turning points. The following figures illustrate.[2]

	Change in G.N.P. $ billn.	Change in Inventory Investment $ billn.
1948/49	− 0·4	−5·6
1949/50	+25·4	+9·1
1953/54	− 5·9	−3·2
1954/55	+29·6	+7·5

For the period before 1914 the existence of common fluctuations in inventory investment and national product is less clear. Goldsmith has recently presented annual estimates of non-farm inventories and G.N.P. in constant (1929) prices extending back to 1897. The recessions of 1904 and 1908 are visible in the G.N.P. data, 15 per cent of the fall of G.N.P. from 1907/8 being accounted for by the inventory factor whilst in 1904 the decline in the rate of inventory investment of $1·1 billn. greatly exceeds the decline in G.N.P. of $0·5 billn. From 1910/11

[1]Abramovitz, *Inventories and Business Cycles*, p. 5.

[2]Data from *Survey of Current Business*, July, 1958, p. 11. Figures are expressed in constant (1954) dollars. Inventory investment relates to non-farm inventories.

the declines are \$1·3 billn. and \$1 billn. respectively. In the recovery of 1904/05 approximately 50 per cent of the increase in G.N.P. is accounted for by the inventory factor. On the other hand G.N.P. declines slightly from 1909/10 despite an increase in the rate of inventory investment of \$1·8 billns.[1] It should be noted that the basic inventory series which Goldsmith presents is far from comprehensive. From 1896 to 1898 it is based entirely on railroad inventories, being reinforced from 1899 to 1902 by a small sample of large corporations. For the remainder of the period the number of large corporations rises to 58 and data for Massachusetts corporations is added.[2] The data should, therefore, be treated with reserve.

The association of short business cycles in the U.S.A. and changes in the rate of inventory investment is therefore well established for the period since 1919 and may have been present in the decade before 1913. The mere association does not, of course, mean that the short cycles have been caused by the changes in inventory investment though many economists would probably accept the proposition of a positive causal relationship.

Discussion of the empirical validity of the inventory cycle has not been extensive.[3] It seems to be agreed that inventory investment does not lead or lag appreciably at business cycle turning points and that this is consistent with the requirements of the model.[4] An implication of the first point is the existence of a lag of total inventories behind output which Metzler claims is consistent with the model, at least as far as total inventories are concerned, though some difficulty arises with the behaviour of a part of the aggregate.[5] Finally, the tendency for inventory-sales ratios to vary inversely with the business cycle which might

[1]Data from Goldsmith, *A Study of Saving in the U.S.*, Vol. III, p. 429 and Vol. I, p. 903.

[2]Goldsmith, Vol. I, pp. 903—09.

[3]The problem is discussed in Abramovitz, *op. cit.* and "The Influence of Inventory Investment on Business Cycles" in *Conference on Business Cycles* (N.B.E.R. 1951) (Metzler contributes also in this study); T. M. Whitin, *Theory of Inventory Management;* R. Nurkse, "Period Analysis and Inventory Cycles," *Oxford Economic Papers*, September 1954.

[4]Cf. Abramovitz and Metzler, *Conference*, pp. 329, 333; Nurkse, *op. cit.*, pp. 203, 209.

[5]Cf. Metzler, *op. cit.*, pp. 329—333.

seem inconsistent with the model has been shown to be consistent if the desired marginal inventory-sales ratio is less than the average ratio.[1].

It has been stressed by Abramovitz that the problem of verification is made troublesome by the enforced dependence on annual observations which makes it difficult to check behaviour precisely in the region of turning points.[2] For the period since 1939 monthly data is now available for sales and inventories in manufacturing, retail and wholesale trade.[3] This data is, however, available only in current values and its usefulness is limited by the severe disturbances of the war and postwar periods, which have affected the inventory policy of businesses.

One approach to the verification of the inventory cycle models does not appear to have been used. This is to test whether the models are consistent in terms of periodicity and stability with the observed cycles in U.S. business.[4] This approach has the advantage that annual data can be exploited to get an estimate of the desired inventory-sales ratios. It must be conceded at this stage, however, that the theory of the self-generating inventory cycle is invalid if it is held to depend on marginal propensities to consume and inventory-sales ratios which are invariant over extensive periods of time. Such relationships do not exist, at least in bi-variate forms. Yet it can be shown that, for periods as long as 10—20 years, the functions have been reasonably steady and that values have been re-established after periods of temporary breakdown. The following discussion must be accepted as relevant only for the sub-periods of relative stability. This limits the scientific value of the discussion but not unduly, it is hoped. Later research may be able to explain the temporary changes in the basic functions in terms of more comprehensive

[1]Abramovitz, *Inventories and Business Cycles*, p. 152 and *Conference* p. 334 ; Whitin, *op. cit.*, p. 119.

[2]E.g. *Inventories and Business Cycles*, pp. 346—7.

[3]Estimates are produced by the Department of Commerce and published in their *Survey of Current Business* and *Business Statistics*.

[4]Metzler's study " Factors Governing the Length of Inventory Cycles " *Review of Economics and Statistics*, February 1947, was concerned with the theoretical effects of changes in the parameters of the model rather than with empirical verification. But he used the probable length of the cycle in planning periods to deduce the empirical length of the period. The present paper reverses this technique.

theories. It will then be possible to develop more sophisticated theories of the inventory cycle.

The present approach involves the formation of plausible estimates of the length of the multiplier time period and the various inventory-sales ratios. The first of these topics involves rather controversial matters and is dealt with in the following section. The measurement of inventory-sales ratios can conveniently be relegated to an Appendix.

II.

Any attempt to determine the periodicity, in calendar time, of macrodynamic models must involve the estimation of the calendar length of the unit period which forms the basis of such models. The unit period, being the time interval between successive creations of income, is identical with the multiplier time period since the actual level of output in any period, for a linear model, can be regarded as the sum of a whole series of multiplier processes resulting from a succession of new injections of effective demand.[1] In view of the enormous volume of discussion, which the multiplier concept has stimulated, it is astonishing how little attention has been directed to the problem of measuring the length of the multiplier time period, although without such an estimate, implicit or explicit, the concept is completely devoid of empirical significance. The names of Machlup, Ackley, Goodwin and Metzler stand out as writers who have recognised this point.[2] The reason for this neglect is doubtless to be found in the complexity of the concept and its potential variability, which makes a direct attack extremely difficult, indeed Ackley whilst stressing the importance of measurement seemed rather pessimistic about the possibility.[3] Since it appears to be distinctly

[1]Cf. Goodwin ; " The Multiplier," in *The New Economics*, (Ed. Harris), p. 484.

[2]Machlup, " Period Analysis and Multiplier Theory," *Quarterly Journal of Economics*, November, 1939, reprinted in American Economic Association, *Readings in Business Cycle Theory* (Page references below refer to the latter source) ; Ackley, " The Multiplier Time Period : Money, Inventories, and Flexibility," *American Economic Review*, June 1951 ; Goodwin, *op. cit.* ; Metzler, " Three Lags in the Circular Flow of Income," (*Income, Employment and Public Policy* : *Essays in* Honour of Alvin Hansen).

[3]*Op. cit.*, pp. 366/7.

futile to theorise at length on the basis of a concept whose magnitude remains unknown, no apology is offered for the present attempt to determine and use a somewhat crude estimate of its probable length in calendar time.

The multiplier time period may be divided conceptually into 2 main components, the lag between the receipt of income and subsequent expenditure out of that income (Metzler's " consumption " or " household expenditure " lag) and the lag between the expenditure of income on goods and services and the subsequent recreation of income though productive activity (Metzler's " output " lag). The ingredients of the " output " lag have been well discussed by Ackley.[1] They may be summarised under the apposite headings suggested by Nurkse[2], the "psychological " and " technical " components. The psychological component covers the time taken by businessmen, throughout the chain of production, to react to an alteration in their level of sales and to decide to translate this into a changed level of orders or production. The technical component will include the time actually consumed in the transmission of orders and the alteration of production schedules together with the actual fabrication time involved in production. Metzler's third lag, the lag of dividend payments behind profits (the " earnings " lag) should perhaps be included in the technical part of the output lag.

We should expect to find that the technical part of the output lag is a complex average of conditions in numerous lines of production with, perhaps, widely different physical conditions. It could be regarded as reasonably stable at least for short periods of time. The psychological part of the lag would also be likely to vary for different industries and has the additional snag of being potentially volatile in the face of changes in the general mood of confidence ; it might well be cyclically variable.

It will be recalled that Metzler concluded on the basis of some rough empirical measurement that the consumption lag, if it exists, " is either short, relative to the quarterly interval, or it applies only to a small part of total consumption."[3] On the other

[1]*Op: cit.*, pp. 357 ff.

[2]" Period Analysis and Inventory Cycles," *Oxford Economic Papers*, November 1954, p. 214.

[3]" Three Lags, etc.", p. 22.

hand the output lag " is strongly indicated, if not decisively demonstrated, by quarterly statistics of net national product and inventories ",[1] the basis for the latter conclusion being the lag in the turning points of the inventory series relative to national product, thus indicating a possible delay in the adjustment of current production to current expenditure on goods.

This picture of the relative length of the two components of the multiplier time period is certainly plausible in the light of everyday knowledge of the economic process, and will be adopted in this paper. But it is necessary to consider two points of criticism. In the case of the consumption lag Metzler compares, graphically, income payments and consumption expenditure in real terms on a quarterly basis. The near equality of the two series together with their autocorrelation is bound to produce a respectable line of regression. This is true even when consumption is plotted against income payments of the previous quarter, though the unlagged relationship looks better. If Metzler had plotted his data in incremental terms the contrast between his lagged and unlagged relationship would not have been nearly so impressive. This can be seen also in the case of data for the postwar period. The coefficient of correlation between real disposable income and consumption for unlagged quarterly data from 1951 (third quarter) to 1958 (first quarter) is 0·99. If consumption is lagged by one period the correlation coefficient is reduced only to 0·98. If the data is used in incremental form to reduce the effects of autocorrelation the correlation coefficients become 0·66 and 0·60 respectively.[2]

Despite the small difference in correlations between the lagged and unlagged relationships it is arguable that Metzler's thesis is still valid. Even with series used on an incremental basis there is bound to be some autocorrelation which will make for similarity of the relationships—indeed one has only to

[1] *Op. cit.*, p. 26.

[2] Series were taken from the Dept. of Commerce data in *Survey of Current Business*, July, 1957, pp. 28/9, May, 1958, p. 6 and *National Income* (1954), pp. 228/9 and are seasonally adjusted. Deflation was by the B.L.S. consumer price index number from *Business Statistics* 1955 and 1957 and *Survey of Current Business*. The period was limited to that specified because of the obvious disturbances caused by the early postwar dis-saving and the Korean War episode.

postulate a constant arithmetic growth rate of income and a constant marginal propensity to consume to see that, in the limit, the correct lag cannot be determined by this sort of procedure. On this question we must resort to common-sense judgment. Since the greater part of disposable income is paid out weekly or monthly it is not likely that the consumption lag will be extensive. This judgment can claim some support from monetary statistics. Goldsmith has presented an analysis of demand deposits and currency in circulation for the U.S.A. by type of holder. From these figures and from his series for personal incomes it is possible to estimate the average number of weeks income held by individuals in the form of cash and demand deposits. The results[1] are :

Average 1920/29	...	...	9·7 weeks
Average 1930/39	...	...	11·3 weeks
Average 1945/49	...	...	19·4 weeks.

Since the money holdings include balances held by non-corporate enterprises and " miscellaneous " categories and must include some quantity of non-active money it seems safe to conclude, for the inter-war period, that the average consumption lag must fall substantially short of 3 months. For the post-war period we should naturally expect holdings of cash and deposits to be exceptionally high.

Metzler's conclusion on the output lag has been criticised recently by Mack and Zarnowitz. They dispute Metzler's argument that " . . . a rise of business stocks after the close of a period of rising income is . . . *prima facie* evidence of a lag of output " on the grounds that " Output and consumption could have perfectly synchronous fluctuations, but if those of output had a wider *amplitude* of movement, stocks would continue to rise after consumption and output had started to fall, until output actually fell below consumption."[2]

This criticism is doubtless valid : the output lag implies a stocks lag, if stocks and sales were previously rising or falling together, but a stocks lag can arise independently. There is also

[1]Sources: Goldsmith, *op. cit.*, Vol. I, p. 382, Col. 5, p. 385, Col. 7; Vol. III, p. 427, Col. 4. All in Current $. Where two figures were given for one year the average was taken.

[2]Mack and Zarnowitz, " Causes and Consequences of Changes in Retailers' Buying," *American Economic Review*, March 1958, p. 47.

some evidence to support the greater amplitude of production compared with sales.[1] However, one must reject their conclusion that " Our analysis makes doubtful the reality of a systematic and necessary lag of production as a whole relative to final sales of finished goods, for which there also seems to be no empirical evidence "[2] if this is interpreted to refer to the " output " lag as they seem to intend. It is a mistake to suppose that the existence of the output lag can be denied because output and final sales move in phase with each other. This condition is fully consistent with the Metzler models and can be interpreted as confirmation of the negligible consumption lag. If consumers expenditure in period t depends on incomes generated in period t then final sales will have the same phasing as production in models indubitably involving an output lag. If the output lag is also made zero disturbances must be propagated with infinite speed! It seems that the authors are not in fact denying the existence of the output lag but merely of a part of the psychological component of the lag. Thus they say that, "The flow of new orders to manufacturers tends to recede from peak levels before manufacturers' output begins to recede; similarly, orders begin to rise from trough levels several months before output does. It seems likely that at least one of the important factors governing the interval by which output lags behind orders is the length of the time required to start and complete production."[3] Their discovery of the average coincidence of orders placed by department stores and orders received by the non-durable manufacturing sector[4] appears to be of limited significance. It certainly suggests that on the average there is a fairly prompt decision by manufacturers to translate new orders into new production, but it does not rule out reaction lags on particular occasions nor does it exclude reaction lags by the retailers even if these are merely connected with the time interval involved in routine periodic ordering.

[1]Mitchell gives the following reference cycle amplitudes (whole cycle) : Non-durable production 40.9 per cent, Production of consumer goods 40.6 per cent, Deflated Dept. Store sales 25.6 per cent. Cf. *What Happens in Business Cycles*, Table 42, pp. 312, 317.

[2]*Op. cit.*, p. 47.

[3]*Op. cit.*, p. 47. Cf. Metzler, *op. cit.*, p. 16.

[4]*Op. cit.*, p. 42.

The difficulties involved in direct attempts to measure the consumption and output lags doubtless account for the fact that the few attempts made to measure the multiplier time period have been indirect. The aggregate lag has been measured by identifying it with the reciprocal of the income velocity of circulation of active money, which has then been estimated.[1] The rationale of this method is easily seen from the discussion of a simple multiplier process where the marginal propensity to consume is equal to unity. A single unit injection of effective demand then generates one unit of income per multiplier time period. The cumulative increase in income generated is equal to the number of multiplier periods which elapse from the initial injection. If the increase in incomes in one year is n then n periods have elapsed and the duration of each period in calendar time is $1/n$ years. Since the whole of the additional income is generated by one unit of new money the income velocity of circulation equals n. Therefore the length of the multiplier time period in year equals the reciprocal of the annual income velocity of circulation. The argument is equally valid for a marginal propensity to consume of less than one provided that the velocity of circulation of active money only is used.[2]

The income velocity approach has met with some criticism which it will be necessary to consider and dispose of before it can be used in the later sections of this paper.

The most obvious objection concerns the existence of idle balances or hoards which, by definition, have a zero velocity of circulation. In principle such balances are strictly excluded from the tautological relationship between income velocity and the period, but, practically, such balances are not identifiable and can be excluded only by adjustments based on guesswork. It may seem absurd that such an element should be allowed to enter into the process of measurement of the multiplier time period ; but let us consider the direction of error introduced if all idle balances are regarded as active. Since the length of the multiplier time period is inversely related to income velocity the effect is to overstate the value of the period, to give an upper

[1]Which, for economy, will be referred to subsequently as the " income velocity approach."

[2]Cf. Goodwin, *op. cit.*, p. 488 and Machlup, *op. cit.*, pp. 210-15.

limit to the value.[1] Such a value will at least make it possible to exclude certain hypotheses. Thus a model of the cycle with a theoretical length of 15 multiplier time periods cannot possibly explain an observed cycle of 10 years if the upper limit of the multiplier period is, say 4 months. If, in addition, we can get a rough estimate of the lower limit of the multiplier period, by other means, it will be possible to exclude models at the other end of the time scale. Further, since it will be shown that the upper and lower limits are quite close it is possible to strike a plausible average, which, if somewhat imprecise, is preferable to complete ignorance.

The fact that the inclusion of idle balances merely raises the limiting value of the multiplier period enables us to dispose of several objections to the income velocity approach. Gardner Ackley has criticised this approach on the grounds that it presupposes a payments cycle which precedes the production cycle whereas, he argues, the reverse is typically the case.[2] But he admits that it is impossible to produce goods, in advance of payment, unless idle balances are activated or new bank money is created. In a system where bank credit was used extensively for the finance of working capital it would be possible to meet his objection without damage to the income velocity approach. If e.g., consumers expenditure is raised and traders reduce their indebtedness to banks, whilst sending new orders to producers in advance of payment, the producers may immediately increase their indebtedness to banks to start production and the process is virtually identical with the cash with order system. In general, however, it is impossible to exclude short term shifts between active and idle balances or creation and destruction of bank money (assuming excess reserves) so that income velocity will vary independently of the multiplier time period. It is interesting to notice that Professor Angell has shown that for the period 1899—1929 the average circular (income) velocity of money in the U.S.A. was reasonably stable and that the marginal velocity was virtually identical with the average velocity during the whole period and during any sub-period of 3—4 years[3]. This may be

[1]Cf. Goodwin, *op. cit.*, p. 488

[2]*Op. cit.*, pp. 350-55.

[3]J. W. Angell, *Investment and Business Cycles*, pp. 148-51.

interpreted to indicate a stability in the average ratio of idle to active money balances over the period of the short business cycle as well as over the long period.[1]

The income velocity approach has also been criticised by Turvey. He points out that:

> " Money received on current account and used to finance Imports or security purchase will later be used to finance Exports or Investment. The speed of this will affect income-velocity but not the income-generation period. Increased dealings in the capital market on capital account will increase active balances (or raise their speed of turnover) without affecting the income-generation period."[2]

These points in effect raise again the idle balances objection. The income velocity approach is valid if new savings are transmitted instantaneously through the capital market and reappear in circulation as expenditure on current investment.[3] Similarly with imports and exports. Any balances tied up in the financial or foreign exchange circulation or as balances held by firms pending expenditure on capital goods are analagous to idle balances and lead to an overstatement of the length of the multiplier time period.

Turvey's second objection to the income velocity approach is that the results of measurement can relate only to the average income generation period and not the marginal period.[4] This is a

[1] Ackley, *op. cit.*, p. 354, repudiates a similar interpretation of Angell's earlier study by Goodwin on the grounds that the long run stability of the total velocity of money is consistent with a long run increase in the velocity of the active component. This is certainly *possible* but he gives no grounds for such a hypothesis. It is possible to specify a time shape for active money which will make nonsense of any theory. Angell's data may not preclude a change in the proportion of active to idle balances but do suggest that the change if any was gradual. This is all that is needed for the purposes of the present discussion.

[2] R. Turvey, " Some Notes on Multiplier Theory," *American Economic Review*, June 1953, p. 295, points 2 and 3.

[3] Cf. Goodwin, *op. cit.*, p. 492.

[4] *Op. cit.*, p. 295, point 4. His point 1 amounts to the same objection. If there is delay in the reaction of households or firms to a change in income or sales the result must be an increase in their cash balances unless there is short term lending, which is dealt with below. The income velocity and multiplier time period are related tautologically for any given marginal process.

valid objection but does not seem critical for the purposes of this paper, since the average length of the period over a number of years is precisely what is required. In this connection the stability of the income velocity over 3—4 year periods noted by Angell is encouraging. Moreover, if the paper by Mack & Zarnowitz can be interpreted correctly as minimising the importance of the psychological component of the output lag the difference between the average and marginal lags is likely to be small since presumably a lag based mainly on technical and institutional factors is less likely to change significantly over the short period, though some cyclical variation cannot be ruled out.[1]

Further possible objections to the income velocity approach must be mentioned. It presupposes that debts arising in the course of production and the expenditure of incomes are settled by cash payments and not by offsetting. What is mainly relevant here is income payments to factors and their expenditures. It seems unlikely that any substantial volume of such payments does not involve the transfer of money. It is true that an enormous volume of intermediate transactions is offset in bank clearings, but the main effect of this is to economise cash holdings of the banking system which would be excluded from the measurement of income velocity. From the standpoint of the income circulation some firm is always holding the basic money whose circulation generates incomes. If the disintegration of production requires the carrying of extra cash balances as A. J. Brown suggests[2] the excess money is again equivalent to idle balances.

The temporary creation and destruction of bank money may also invalidate the income velocity approach. It is easy to construct models in which the money required for debt settlements is created on the last day of the unit period, circulates with great rapidity, and is then destroyed until the corresponding day in the next period. Such a model can display an income velocity

[1]Of course a zero average reaction time is consistent with substantial deviations around the average. But the argument of the paper is not concerned with any single income-generation period.

[2]*The Great Inflation*, p. 176. The same argument applies to any extra balances required by virtue of the particular institutional system of payments intervals as analysed by J. W. Angell in " The Components of the Circular Velocity of Money," *Quarterly Journal of Economics*, Vol. 51, and H. S. Ellis, "Some Fundamentals in the Theory of Velocity," *Quarterly Journal*, Vol. 52.

of infinity or an apparently zero multiplier time period. However, if the money supply was only measured on the last day of the period no paradox would arise. The practical significance of this point arises in cases where money balances which would indubitably be regarded as " active " are cancelled temporarily by the repayment of bank debt. But even here it is necessary for the banks to carry excess reserves and to allow a variable cash ratio. If bank advances are replaced by temporary purchases of securities then the apparently idle balances may be used quite validly to measure the income velocity of circulation of active money.

A final objection to the income velocity approach is that it assumes the absence of short term lending and borrowing of balances which are nominally in the active circulation. If a consumer earmarks part of his current income in a demand deposit account for, say, payment of a large insurance premium or purchase of durable goods the circulation period will correctly measure his average consumption lag. If, however, he holds his earmarked active balances in a time deposit account his apparent circulation period will fall below its true value[1] as it will also do if he lends it out for any purpose which leads to its use in the active circulation, e.g., a productive process which is self liquidating inside the time interval of the consumers' lag.[2] There can be no doubt that some short term lending of what is strictly transactions money does take place, though one may doubt its significance. The effect of this, in isolation, is to cause the income velocity approach to underestimate the length of the multiplier time period. In practice this error is probably more than compensated by the idle balance factor but this cannot be proved. The argument may, however, be exploited. Any econometric attempt to isolate active money[3] will yield an estimate of the income velocity of circulation which from the standpoint of the income velocity approach is too high. The implied measure of the multiplier period should, therefore, represent a lower limit

[1]This anticipates the point that time deposits are usually excluded from calculations based on the income velocity approach.

[2]Or a series of such transactions assuming that the short term loan is continuously refinanced.

[3]E.g., that of Dr. Khusro " An Investigation of Liquidity Preference," *Yorkshire Bulletin of Economic and Social Research*, February 1952.

of the average value. On this basis Dr. Khusro's estimate of the income velocity of active money in the U.S.A. of 5·52[1] yields a value for the average multiplier time period of 2·2 months, the true value being, presumably somewhat higher than this.

The following table assembles the data required for the estimate of the probable upper limit of the average multiplier time period for the U.S.A.

Period	Money[2] Stock $ bill.	G.N.P.[3] $ bill.	G.N.P.[4] $ bill.	Circulation Period (months) (5)	(6)
1894/1903 ...	5·23	15·71	—	4·0	—
1899/1908 ...	7·68	21·58	23·22	4·3	4·0
1904/1913 ...	9·62	28·78	30·36	4·0	3·8
1919/1928 ...	23·48	81·20	87·31	3·5	3·2
1924/1933 ...	23·92	79·13	85·05	3·6	3·4
1929/1938 ...	25·01	69·95	78·25	4·3	3·8
1948/1952 ...	117·3	—	294·7	—	4·8
1953/1957 ...	135·2	—	393·0	—	4·1

The circulation period relative to the Dept. of Commerce G.N.P. concept is somewhat smaller than that relative to the Kuznets " peacetime " concept of G.N.P. since the Dept. of Commerce concept includes items of government expenditure on goods and services which the Kuznets concept excludes.[7]

[1]*Op. cit.*, p. 15. I am informed by Dr. Khusro that his estimate is based on Kuznets' series for Net National Product (wartime concept) whereas my own calculations below relate to G.N.P. (peacetime concept). Since the ratio of N.N.P. to G.N.P. (wartime concept) is more or less constant at about 88 per cent it is possible to adjust the relevant regression coefficient roughly to a G.N.P. basis by multiplying by 0·88. This gives an estimate of the income velocity of circulation of 6·27 or a multiplier time period of slightly less than 2 months.

[2]Demand deposits adjusted and currency in circulation outside banks. From *Historical Statistics of U.S.A.*, pp. 276—77 ; *Business Statistics* 1957, p. 92 ; *Survey of Current Business*, May, 1958, p.S.18. Prewar figures are annual averages of June 30th figure. For post-war period average annual mid-year values were estimated from year end figures.

[3]Kuznets, *National Product since* 1869, p. 119. " Peacetime " concept. Average annual values.

[4]Figures from 1899/1933 are Kuznets data on Dept. of Commerce basis from Goldsmith, *op. cit.*, Vol. III, p. 427. Remaining figures are Dept. of Commerce data from *Survey of Current Business*, July 1957, pp. 8—9 and May 1958, p. 6. Annual averages.

[5]Circulation period relative to Kuznets basis G.N.P.

[6]Circulation period relative to Dept. of Commerce basis G.N.P.

[7]See Kuznets, *op. cit.*, pp. 22-23.

The Dept of Commerce basis is probably more relevant for the current discussion, but the differences are slight. It is seen that apart from the 1920's and the period 1948—52 the circulation period is remarkably constant with a length of about 4 months. The lower level of the 1920's is explained by the fact that demand deposits in that period were unnaturally low because of the policy of the banks. According to Woodlief Thomas:

" In the 1920's [time deposits] could be easily withdrawn from many banks, and sometimes included current funds that might otherwise have been in demand deposits."[1] It may be noted that the ratio of the money supply including time deposits to G.N.P. (Kuznets basis) was the same for 1919/28 as for 1904/13 viz., ·545 whilst the ratio for 1894/1903 was ·505. This is consistent with the idea that the circulation period based on true demand deposits plus currency in circulation was constant at about 4 months for the whole period from 1894 to 1938. The abnormally high value of the period for 1948/52 is easily understood, the trend seems to be back towards the pre-war normal value of 4 months.

It is proposed, therefore, to assume that the upper limit of the average length of the multiplier time period in the U.S.A. is approximately 4 months. The lower limit was fixed at approximately 2 months. It is proposed to take the mean value of 3 months as the probable average value for the purposes of subsequent discussion. Doubtless this is wrong, but, if the preceding discussion is valid, it will not be very far wrong. The value of 3 months has already been proposed by Machlup[2] whilst Angell has suggested estimates of 3·15 to 3·33 months for the circulation period of active money.[3]

As a rough check to the proposed estimate we may approach the problem by estimating conservatively the values of the components of the multiplier period. The average circulation

[1]Federal Reserve, *Banking Studies*, p. 302. *Cf.*, also Angell, *op. cit.*, p. 144.

[2]*Op. cit.*, p. 214.

[3]*Op. cit.*, p. 145. He assumes that the average and marginal propensities to hoard cash were identical over the period 1899 to 1929 (pp. 150-51) and isolates active money by assuming that idle balances never fell below 10 per cent or 15 per cent of the aggregate of circulating money during the 6 years when the velocity of total money reached peak values (p. 339).

period of individual's balances for the inter-war period was 10—11 weeks. Of this some 3 weeks is accounted for by cash in circulation. On the drastic assumption that only this is active money—all demand deposits being idle—the average consumption lag is 3 weeks. The traders reaction lag will be 2 weeks on the basis that traders order at monthly intervals and proceed, mechanically, to base new orders on the basis of sales behaviour. Allow a further 2 weeks for manufacturers to react and to change production schedules. Abramovitz has estimated the average fabrication period in U.S. manufacturing in 1939 at 20—25 days.[1] Allowing for the discontinuity of weekly payments to factors this gives 2 weeks for production time. This gives a total lag of 9 weeks assuming that production of raw materials proceeds side by side with manufacturing. It would be astonishing if the actual average length of the multiplier period was less than this.

III.

It is now possible to examine the periodicity in calendar time of models of the inventory cycle. In what follows the procedure of Metzler and Nurkse will be adopted and the length of the multiplier time period will be considered as consisting entirely of the output lag. Consumption in period t will be determined by income in period t. As Nurkse has shown this assumption leads to model sequences in which the current rate of actual inventory investment reaches turning points coincidently with those of aggregate output. This is consistent with the observed behaviour as far as this can be judged from annual data. The assumption, commonly used, that the multiplier period consists entirely of the consumption lag is disturbing to common sense ideas and results in models of the cycle in which inventory investment leads total output at turning points.[2] Nurkse suggests that no evidence is available for such a persistent lead. This statement is not altogether justified since Abramovitz admits that his annual data would be consistent with a lead or lag of up to 3 months at turning points for inventory investment in manufacturing.[3]

[1] *Inventories and Business Cycles*, pp. 171-75, 380.

[2] Nurkse demonstrates this *op. cit.*, p. 220.

[3] *Inventories and Business Cycles*, p. 338.

On this basis we can set up a simple inventory cycle model of the Metzler type.

$O_t \equiv$ total output in period t.
$A_t \equiv$ output of fixed investment goods in period t. (Assumed produced to order and constant).
$O^c{}_t \equiv$ output of consumer goods in period t.
$C_t \equiv$ expenditure on consumer goods in period t.
$\alpha \equiv$ marginal propensity to consume.
$\beta \equiv$ marginal inventory-sales ratio.

All variables are deviations from an initial equilibrium. We assume that producers expect consumers' expenditure in period t to equal that of period $t-1$ so that production for sale in period $t = C_{t-1} = \alpha O_{t-1}$

Planned inventory investment in period t can be broken down into 2 components,

(1) Reversal of the unplanned change in period $t-1$, i.e. $C_{t-1} - C_{t-2}$ (actual—expected consumption),

(2) Desired increase in inventories $= \beta(C_{t-1} - C_{t-2})$.

$$\therefore\ O^c{}_t = \alpha O_{t-1} + \alpha(O_{t-1} - O_{t-2}) + \alpha\beta(O_{t-1} - O_{t-2})$$
$$O_t = \alpha(2+\beta)\, O_{t-1} - \alpha(1+\beta)\, O_{t-2} + A_t.$$

It is superfluous to repeat the well-known theoretical analysis of this 2nd order difference equation. Sufficient to say that stability requires $\alpha\,(1+\beta) < 1$ and that, if cyclical, the number of periods is determined by $360°/\theta$ where

$$\text{Cos}\ \theta = \frac{\alpha\,(2+\beta)}{2\sqrt{\alpha\,(1+\beta)}}\,.$$

It would be astonishing if the behaviour of output in a modern industrial economy could be determined by anything as simple as a 2nd order difference equation. Testing the above type of model is, therefore, only a formal introduction to the subsequent analysis.

To test for periodicity and stability we require plausible values for α and β together with the assumed value of the multiplier time period. These values have been taken from data by Kuznets and Abramovitz. The question of the validity of assuming constant inventory-sales ratios is examined in the Appendix. At this stage it is sufficient to use rough values for the period of the 1920's.

For the period 1921—29 the relationship between aggregate real consumption and G.N.P. is closely linear and yields a value for α of 0·71. Total inventories in manufacturing and trade at constant prices plotted against aggregate consumption yield a marginal inventory-sales ratio of approximately 0·28 on an annual basis.[1] Since β has the dimensions of time it takes values of 1·68, 1·12 and 0·84 for multiplier periods of 2, 3 and 4 months respectively. On this basis the simple model of the inventory cycle yields definitely explosive cycles of periodicity between 38 and 52 months. The actual values are :

Multiplier period (months)	$\alpha\,(1+\beta)$	θ	Duration of cycle in months
2	1·90	18·7°	38
3	1·51	25·5°	42
4	1·31	27·9°	52

The length of the cycle in calendar time lies within limits which are close to the actual length of the short cycle of the 1920's but seem to be on the high side. The notable feature is the marked instability of the model which in all cases leads to explosive fluctuations. It is not easy to decide whether the actual behaviour of, say, manufacturing production in the 1920's was stable or unstable in the sense of the model, but it appears to the writer that an explosive system would need some drastic amendments to make it consistent with the actual time shape of manufacturing production. If the most unstable element of the index is taken, viz., durable manufactures the successive declines from peak to trough are 55 per cent (1920/21), 22 per cent (1923/24) and

[1]Data from Abramovitz, *op. cit.*, p. 567 and Kuznets, *op. cit.*, pp. 35, 52. " Wartime " concept of G.N.P. For inventories the year end value plotted against annual consumption. Reasons are given in the Appendix for the implied 6 months lag. Nurkse has implicitly criticised Metzler for using an *average* inventory-sales ratio and has commented that a constant average ratio is unrealistic and suggests that his " square root " formula leads plausibly to a roughly constant marginal inventory-sales ratio (*op. cit.*, pp. 206, 221–22). It seems though that if the inventory formula is of the type Inventories = Constant $\times$ $\sqrt{\text{Sales}}$ the marginal inventory-sales ratio is equal to one-half of the average ratio. In fact the empirical data suggests that a constant marginal inventory-sales ratio is a valid assumption over periods long enough to assume away the possible divergence between desired and actual inventories which Nurkse mentions on p. 221.

13 per cent (1926/27).[1] The data seems more easily consistent with a non-explosive model. If this is accepted we must conclude that the simple model gives unrealistic results and seek appropriate modifications of the model.

The assumed value of the parameter a is an obvious target for criticism. It may be argued that the marginal propensity to consume should relate consumption with disposable income rather than with G.N.P. and that more sophisticated versions of the Modigliani-Duesenberry type should be used as these have better predictive powers.[2] Neither objection is serious for the 1920's. It can be shown that the relationship between G.N.P. and disposable income for the period 1920/29 is virtually a straight line[3] A similar relationship has been noted by Ta-Chung Liu and Ching-Gwan Chang for the 1930's and the post-war period.[4] Also, except for 1921, G.N.P. increased each year during the period. For a multiplier period of 3 months the model would be unstable even with a as low as 0·48 and such a value seems out of the question.

The model is defective, however, for a number of reasons. In the first place, it makes no distinction between the consumption of manufactured goods and the consumption of services. For the 1920's these stood in a (marginal) relationship of 2 : 1 and it is absurd that the marginal consumption of services, which has little direct relevance for inventory policy should be allowed to interact with the inventory accelerator. If a distinction is made, in the model, between the two categories, the result is to reduce the degree of instability and also the periodicity. This can be seen by examining the results of the amended model. If a_1 now defines the marginal propensity to consume services and a_2 the marginal propensity to consume manufactures, the

[1]From monthly turning points in the seasonally adjusted index, *Federal Reserve Bulletin*, December 1953, p. 1326.

[2]Cf. R. Ferber, *A Study of Aggregate Consumption Functions* (N.B.E.R.).

[3]Using data from Goldsmith, *op. cit.*, Vol. III, p. 429, for disposable income in 1929 values and Kuznets G.N.P. series on the Dept. of Commerce basis. If Kuznets " wartime " concept of G.N.P. is used the relation is still virtually linear with a slight change in slope.

[4]" Consumption and Investment Propensities." *American Economic Review*, September 1950, p. 579.

characteristic equation of the amended model becomes[1]

$$\chi^2-[a_1+a_2(2+\beta)]\chi+a_2(1+\beta)=0$$

Using the same data as before, we have $a_1=0{\cdot}25$, $a_2=0{\cdot}46$ and $\beta=0{\cdot}43$ on an annual basis.[2] So for the same values of the multiplier period we have:

Multiplier period (months)	$a_2(1+\beta)$	θ	Duration of cycle (months)
2	1·65	23·3°	31
3	1·25	28·7°	38
4	1·05	30·6°	47

The periodicity and instability are reduced despite the fact that the change of assumption causes an increase in the value of the inventory accelerator. The range of duration in calendar time is now highly plausible for the 1920's though the degree of instability is still unacceptable.

A second defect of the model is that it exaggerates the income generated by the inventory policy of businessmen by neglecting the question of the correct valuation of inventories. Production for sale can validly be estimated in prices paid by final buyers. It is true that income arising in the manufacturing sector will fall below the value of sales to consumers by the profit margins of traders. On the other hand, no allowance has been made for the effects of current expenditure by consumers on dealers incomes. This is a feature of the negligible consumption lag. Consumers'

[1]This assumes that the overall consumption-output lag for services is the same as in manufactures. This is an arbitrary judgment but it can be shown that the consequences of alternative plausible assumptions are not significantly different.

[2]The value for a_2 is the regression value for the period 1921/29 using a visual fit. The value for a_1 was obtained as follows: Kuznets' "alternative" estimate of services (*op. cit.*, p. 34) was adjusted to exclude from the current values the sum of direct taxes and the value of imputed rents (as given in *National Income and its Composition*, Vol. 2., p. 735). The resulting figures were deflated by the price index for services and were plotted against Kuznets G.N.P. in 1929 prices adjusted for the difference between his two estimates for the flow of services. The value of the marginal propensity to consume services was then taken by visual fit. This method was adopted because Kuznets' standard estimate of services, being a residual, behaves very erratically in the 1930's and cannot be used to get an estimate of a_1 for that period. The method discussed yields the same value of a_1 for the 1920's, as is obtained by using Kuznets' standard estimate for services in conjunction with his "wartime" G.N.P.

expenditure in the period depends on income (output) generated in that period. But this expenditure causes liquidation of stocks of goods in the same period which generates incomes for the traders. Ideally, part of these incomes should be respent in the same period causing a further liquidation of stocks of final goods etc. There is, thus, a sub-multiplier process in each period which could complicate the model considerably. By assuming that production of goods for sale to consumers in period t equals consumers expenditure in period t—1 we are, in effect, assuming a one period lag in the generation of incomes arising in the trade sector.[1] The reversal of the unplanned change in inventories should not be valued at final prices since this change in stocks will generate (or reduce) incomes only to the extent of the values at cost. It is therefore appropriate to introduce a constant λ into this term to reduce the final values to cost values. The final item of production, the desired change in stocks is correctly measured in the model since the coefficient β is a ratio of inventories at cost to sales at final prices. The amendment for the reversal component of the model leads to the following modified characteristic equation.

$$\chi^2-[a_1+a_2(1+\lambda+\beta)]\,\chi+a_2(\lambda+\beta)=0$$

The value of λ can only be guessed. For an aggregate of inventories in manufacturing and trade it may be reasonable to put $\lambda=\frac{1}{2}$. With this amendment the behaviour of the model becomes as follows :

Multiplier period (months)	$a_2(\lambda+\beta)$	θ	Duration of cycle (months)
2	1·42	26·7°	27
3	1·02	31·1°	35
4	0·82	32·3°	45

As compared with the original values the range of duration of the model is now highly plausible for the 1920's and a substantial gain in stability has been achieved. Although the model based on a 3 month period is still explosive it would be stable against a growth trend of about 4 per cent or more such as occurred in the

[1] This is a convenient, if backhanded, way of allowing for some distributed lag in consumers' expenditure.

1920's. The model is, however, still very much over-simplified and we must now consider modifications which have a destabilising effect unless they are combined with more complicated assumptions regarding businessmen's inventory-sales policy.

The most important amendment needed is the separation of the trade and manufacturing sectors. The practice of aggregating business inventories means that manufacturing inventories are allowed (required) to vary in response to changes in the rate of consumers' buying as reflected in traders' orders. But it does not allow for any change in manufacturers' stocks in relation to that part of traders' orders which is intended for inventory purposes. Obviously this reduces the effective value of the overall inventory accelerator.[1] The change has the incidental advantage that the inventory-sales ratios of the model are more likely to reflect meaningful and stable relationships than when the two sectors are aggregated. It is appropriate at this stage to summarise the discussion of inventory-sales ratios in the Appendix. The relationship between trade inventories and expenditures by consumers on manufactured goods in constant prices and between manufacturing inventories and sales in constant prices has been examined. In neither case can the experience of the period since 1920 be described in terms of a single relationship between inventories and sales. Yet there are interesting elements of stability in sub-periods. In the case of the trade sector the experience of the 1920's and the 1950's can be fitted closely to a single regression line as can the late '30's and the early 1940's. The slope of the regression line of the late 30's and early 40's is practically the same as that for the 1920's and 1950's. Thus, the marginal inventory-sales ratio has been constant for 3 sub-periods 1920/32, 1935/42 and 1951/57 and the inventory-sales ratios for each of these periods are remarkably similar. In the case of manufacturing a slightly different pattern is observed. A linear regression line can be fitted to manufacturers' inventories and sales (including sales to other manufacturers), in real terms, for the period 1929/42, 1947/50, with a correlation coefficient of 0·98. It seems probable that this relation is also valid for most of the 1920's. After 1950 there is a break in the relation, the new relation being shifted upwards but very approximately parallel

[1]Cf. Nurkse, *op. cit.*, pp. 208 ff.

with the old one. If sales are estimated net of intermediate transactions there is a linear relation for the period 1920/38 with a correlation coefficient of 0·85. In each sector the marginal inventory-sales ratios are sufficiently steady in sub-periods to warrant the assumption of a normal, desired relationship.

We may now proceed to the testing of models of the inventory cycle which involve the separation of the trading and manufacturing sectors. It will be necessary to extend the previous notation as follows :

Let $O_t \equiv O^s_t + O^m_t$ (1)

where $O^s_t \equiv$ output of services in period t.

and $O^m_t \equiv$ output of manufactured goods in period t.

$C^s_t \equiv$ consumption of services in period t.

$C^m_t \equiv$ consumption of manufactures in period t.

It is assumed that $C^s_t = a_1 O_t$, $C^m_t = a_2 O_t$ i.e., the consumption lag is zero and the output lag, which constitutes the multiplier time period, is the same in each sector[1]

Let $O^m_t \equiv P^T_t + P^m_t + A_t$, (2)

where $P^T_t \equiv$ traders' orders (of period t—1) for production and delivery in period t,

$\equiv$ production in period t for sale to consumers and addition to trade stocks,

$P^m_t \equiv$ production for manufacturers' stocks in period t,

$A_t \equiv$ production of fixed capital goods to order (Autonomous investment).

[1]In fact it is immaterial whether we assume a consumption lag or output lag in the case of services provided the overall lag is the same in each sector. As noted earlier the true consumption lag in the model is not strictly zero because of the assumed delay in the spending of income arising in the trade sector.

All variables are, initially, deviations from a previous equilibrium value. The variable P^T_t, traders orders, will, as before, consist of 3 elements, expected sales to consumers at final prices, the reversal of the unplanned change in stocks, at cost, and the desired increase in inventories at cost. We have therefore,

$$P^T_t = a_2\,(1+\lambda+\beta_1)\,O_{t-1} - a_2\,(\lambda+\beta_1)\,O_{t-2}, \tag{3}$$

where λ as before reduces values at final prices to values at cost and β_1 is the marginal inventory-sales ratio for the trade sector.

Equation (3), therefore, measures the aggregate income generated, in period t, in manufacturing and trade, apart from that part which stems from the desired increase in manufacturers' stocks.

The variable P^m_t is determined by the marginal inventory-sales ratio in manufacturing, β_2, which relates manufacturers' desired inventories and their sales to traders. This variable cannot be linked to the rate of change of P^T because the latter includes elements valued in different sets of prices. To compute P^m_t it is necessary to correct P^T so that it measures uniformly in cost or final prices. Which set is chosen is unimportant since the empirical estimate of β_2 will adjust automatically. In the following argument β_2 will be taken as the marginal ratio between manufacturers' inventories at cost and their sales to traders at final prices. We have therefore,

$$\begin{aligned} R^T_t &\equiv \text{deliveries to traders in period } t \text{ valued at final prices.} \\ &= a_2 O_{t-1} + \lambda^{-1}\lambda a_2\,(O_{t-1} - O_{t-2}) \\ &\qquad + \lambda^{-1}\beta_1 a_2\,(O_{t-1} - O_{t-2}), \\ &= a_2\,(2+\beta_3)\,O_{t-1} - a_2\,(1+\beta_3)\,O_{t-2}, \\ \text{where } \beta_3 &\equiv \lambda^{-1}\beta_1. \end{aligned} \tag{4}$$

Since the model assumes that manufacturers' deliveries in any period equal production in that period, there is no scope, as in the case of the trade sector, for unintended changes in manufacturers' stocks. Thus, we might make $P^m_t = \beta_2\,(R^T_t - R^T_{t-1})$.

But this implies that manufacturers' inventories move in phase with their sales. In view of the evidence for a substantial lag of manufacturers' inventories relative to their sales it is better to make

$$P^{m}_{t}=\beta_2\left(R^{T}_{t-2}-R^{T}_{t-3}\right). \tag{5}$$

For a 3 month multiplier period this will give inventories a lag of 6 months behind sales as noted by Foss and Holmes[1] and is reasonably consistent with the findings of Abramovitz[2]. For multiplier periods of different values the assumption would not be strictly valid, though it would not do great violence to the facts if a range of say $2\frac{1}{2}$ to $3\frac{1}{2}$ months is considered.

Equations (1) to (5) now combine to give the basic difference equation of the model

$$\begin{aligned} O_t=&[a_1+a_2\,(1+\lambda+\beta_1)]\,O_{t-1}-a_2\,(\lambda+\beta)\,O_{t-2}\\ &+a_2\beta_2\,(2+\beta_3)\,O_{t-3}-a_2\beta_2\,(3+2\beta_3)\,O_{t-4}\\ &+a_2\beta_2\,(1+\beta_3)\,O_{t-5}+A_t. \end{aligned} \tag{6}$$

Even the present greatly oversimplified model yields a difference equation of the 5th order.[3] It is not intended to treat this and other equations in the conventional manner, accorded to the 2nd order equations, if indeed that is possible; the approach will be strictly empirical. However, it may be stated that the various examples of 5th and 6th order equations which have been examined seem to yield, typically, a characteristic equation which may be analysed into one or two real roots and a double quadratic equation with no real roots. It is possible to check the stability of these equations by means of the Routh-Samuelson conditions.[4] The periodicity of such equations seems most easily examined by generating a test sequence for the equation when appropriate values have been inserted for the various parameters. This procedure also checks the existence or non-existence of stability but the test is less rigorous than the Routh-Samuelson test where models are near the margin of

[1] *Survey of Current Business*, April, 1951, See discussion in the Appendix.

[2] *Inventories and Business Cycles*, pp. 97, 110–21.

[3] We may note, in passing, that equation (6) yields the usual equilibrium condition if A_t is regarded as constant, *viz.*, $\overline{O}\,(1-a_1-a_2)=\overline{A}$.

[4] P. A. Samuelson, *Foundations of Economic Analysis*, pp. 429–39.

instability, because of the inevitable small errors arising from the rounding off of figures. This method of testing periodicity may seem crude but it is perhaps more directly informative than any theoretical solution of the equations,[1] and has the virtue that in practical cases what will be observed is the cycle resulting immediately from an autonomous shock, or succession of shocks, and not the ideal cycle which results when the system has been allowed to settle down to its inherent oscillation unencumbered by extraneous interferences.[2]

The procedure of testing dynamic models by comparing periodicities of a theoretical model and the actual cycle has been criticised by T. Haavelmo[3] on the grounds that a model with a non-cyclical solution may produce a " realistic " cycle in conjunction with a series of random shocks. Haavelmo presents an example of such a model which generates a " realistic " time series with a " major " cycle of 9—10 " years ". The idea is, of course, familiar in the literature of business cycle theory as the " erratic shock " theory of Professor Frisch.[4] Moreover, G. Orcutt has suggested that certain economic time series for the U.S.A. 1919—1932 are consistent with the behaviour of such a theoretical schema.[5] It is obvious by inspection of Haavelmo's diagram[6] that the theoretical cycle follows very closely the pattern of fluctuation of the random shock factor. Therefore any attempt to explain real cycles in terms of such models must be accompanied by evidence that the structure of the model is relevant (e.g. a high

[1]See *e.g.*, the complicated form of the theoretical solutions for a relatively simple 3rd order equation given by J. R. Sargent, " The Supply Factor in Professor Hicks' Theory of the Cycle," *Economic Journal*, December 1956, pp. 658–61.

[2]It is not suggested that the periodicity of the cycle must necessarily differ in the earlier and later stages, but presumably this is possible. In the various sequences which have been examined there are minor differences in the duration of upswings and downswings, but these are probably explained by the "theoretical" solution not being an intregral number of unit periods. The cycles are fairly regular if measured between peaks or troughs. The test sequences have all been generated by a small exogenous increase sustained for 2 unit periods.

[3]" The Inadequacy of Testing Dynamic Theory by Comparing Theoretical Solutions and Observed Cycles," *Econometrica*, October 1940.

[4]Cf. J. R. Hicks, *A Contribution to the Theory of the Trade Cycle*, p. 90.

[5]G. H. Orcutt, " A Study of the Autoregressive Nature of the Time Series used for Tinbergen's Model of the Economic System of the United States, 1919–1932," *Journal of the Royal Statistical Society*, Series B, 1948.

[6]*Op. cit.*, p. 318, fig. 2.

marginal propensity to consume and negligible induced investment of any type), that random elements of autonomous expenditure exist with the appropriate amplitude of fluctuations and that the time unit chosen has theoretical and empirical relevance. The selection of the calendar year as the unit period in these models is entirely gratuitous. Unless these conditions are met the resemblance between the time shape of economic series and the sequences generated by erratic shock models is merely a curiosity which belongs to the compartment of business cycle literature reserved for the behaviour of sunspots and transits of Venus.

The significance of Haavelmo's discussion for the present paper is that it raises the question whether the test sequence procedure to be used could be so modified by the existence of random factors as to make the predicted length of the inventory cycle meaningless or misleading. The fact that most of the models examined are near to the point of instability suggests a negative answer. In order to test this point the test sequence behaviour of 4 second order models has been examined against a suitable random shock component. The models are as follows :

$$O_t = 0{\cdot}90\, O_{t-1} - 0{\cdot}18\, O_{t-2} - 0{\cdot}22 + u_t \quad (1)$$
$$O_t = 1{\cdot}732\, O_{t-1} - O_{t-2} - 0{\cdot}232 + u_t \quad (2)$$
$$O_t = 1{\cdot}688\, O_{t-1} - 0{\cdot}95\, O_{t-2} - 0{\cdot}238 + u_t \quad (3)$$
$$O_t = 1{\cdot}643\, O_{t-1} - 0{\cdot}90\, O_{t-2} - 0{\cdot}243 + u_t \quad (4)$$

Model (1) has a highly damped non-cyclical solution ; the remaining models have a theoretical cycle of exactly 12 unit periods, (2) being perpetual whilst (3) and (4) are moderately damped. The values used for u_t were identical for each model, and were taken from a sample of Tippett's random numbers[1], using the values 1 to 9 in the form 0·1, 0·3, etc. The expected value of u_t, together with the constant term in each equation, gives an expected equilibrium value of unity in each case and the maximum possible amplitude of fluctuation of the random element corresponds to about 3 times the size of the implicit constant autonomous component. The random element consisted of a series of 112 items[1] which displayed 33 complete " cycles " with a model value of 3 units and 28 " cycles " within a range of 2—4 unit periods.

[1]The first 2 items of the random series were taken as 0·6 to provide a start to the sequence, though this refinement was probably unnecessary.

The test sequences show a clear difference in the response of the models. The behaviour of model (1) is obviously dependent on the time shape of the random factor. No obvious major cycle was present in the sequence of 112 items and the analysis, using every local maximum as a peak shows the following distribution of periods.

Length of cycle (unit periods) ...	2	3	4	5	6	7	8	9
Number of cycles	2	5	6	5	2	—	1	2

The behaviour of the remaining models shows the strong influence of the cosine wave ; minor cycles intrude only in isolated cases in models (3) and (4). The following table analyses the distribution of individual cycles in the several models, the minor cycles of (1) being grouped as far as is possible into " major " cycles for purposes of comparison. The intervals are measured between successive peaks.

Model	Number of complete cycles with periodicity of given length in unit periods.											
	5	6	7	8	9	10	11	12	13	14	15	16
(1)	4	5	1	1	2	1	—	1	—	—	—	—
(2)	—	—	—	—	—	—	1	8	—	—	—	—
(3)	—	—	—	—	—	1	2	5	—	—	1	—
(4)	—	—	—	—	—	3	2	1	1	1	—	1

Whilst it is clear that the random element can distort the true duration of the cycle the majority of cycles do not diverge from the theoretical length by more than 2 periods. Since it is hoped that the severity of fluctuation of the erratic element in this test is distinctly greater than would arise in practice it is concluded that a comparison of theoretical and actual periodicities is not misleading in the case of moderately damped models.[1]

The second part of this article will examine the behaviour of the model defined in equation (6), and others, in relation to the actual short cycles in U.S. production since 1920.

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[1]Most of the high order empirical difference equations examined in the later sections of the paper show a degree of damping equivalent to the range shown in models (2)–(4).

APPENDIX

RELATIONSHIPS BETWEEN INVENTORIES AND SALES IN U.S. TRADE AND MANUFACTURING

We begin with the trade sector, investigating the relationship between aggregate trade inventories as given by Abramovitz and consumption of manufactured commodities as given by Kuznets, both in 1929 prices.[1] If data for the period 1920/38 are plotted it is immediately obvious that no plausible line of regression can be fitted for the whole period. For the period 1920/32 (inclusive) the data conform to a regression line,

Inventories = 3·836 + ·194 Consumption ($billions).

The correlation coefficient of 0·94 indicates a fairly close relationship.[2] After 1932 the volume of inventories deviates from the regression line and is approximately constant from 1933/35 by which time it falls short of the regression value by some $2.7 billn. or 21 per cent of the predicted value. From 1935 to 1938 the marginal inventory-sales ratio is again equal to the regression value for the period 1920/32, thus inventories in 1937 were $2.8 billn. below the predicted value.

In order to test the inventory-sales relationship over longer periods of time I have tried to link up the Dept. of Commerce data with the Abramovitz, Kuznets data. The results of this exercise are interesting. From 1939/42 the data conform almost exactly to the line of 1935/37 i.e., the observations fall on a line parallel with the regression line of the 1920's. The mean deviation of actual inventories from the regression line over 1940/42 is $2·9 billions. After this the new relationship is broken, the level of inventories is roughly constant at a low level from 1943/45. Beginning in 1946 there is rapid growth in inventories relative to sales so that after 1950 the observations have virtually regained the regression line of the 1920's. This can be seen by comparing the 1920/32 regression with the following computed for 1920/32 and 1951/56.

Inventories = 4·35 + ·182 Consumption ($ billions) (r = 0·997)

The mean deviation of inventories 1951/56 from the 1920/32 regression line is less than 3 per cent of the average of actual values.

Examination of the observations for 1951/57, in isolation, suggests, however, a lower marginal ratio than for the period 1920/32 with an annual marginal ratio of approximately 0.12 against 0.19 for the 1920's.[3] A

[1] Abramovitz, *Inventories and Business Cycles*, p. 567 ; Kuznets, *National Product since* 1869, p. 35 (aggregate flow of goods to consumers less services).

[2] The correlation coefficient is quoted here in a purely descriptive sense. It is highly significant by the " *t* " test but the presence of serial correlation in both series might be held to invalidate such a test. According to J. Durbin and G.S. Watson the existence of such serial correlation need not invalidate least squares regression provided that the error terms in the regression model are independent (" Testing for Serial Correlation in Least Squares Regression," *Biometrika*, Vol. 37, p. 409). In the present case, according to their test the existence of serial correlation in the residuals is not significant either at the 1 per cent or 5 per cent levels. Their tables (Biometrika, Vol. 38) do not extend below 15 observations but the calculated value of their parameter *du* of 1·5 lies well above any conceivable extrapolated value for *du* at either level.

[3] Inventories for retail and wholesale trade were taken from Dept. of Commerce, Business *Statistics*. (1955) pp. 49 and 55 and *Survey of Current Business*, July 1957, pp. S. 10–11. Unadjusted data were used to conform to Abramovitz. Retail inventories for 1939/50 were raised by a factor of 1·016 on basis of the ratio of the old/new series in 1950. Aggregate inventories were deflated by the implicit price of manufactured consumer goods as revealed by the Dept. of Commerce estimates for consumer expenditure (excluding services) in current and constant prices. This price was corrected by the ratio of the B.L.S. wholesale price index number (all commodities) for the 4th quarter to the yearly average. The result was divided by 151·5 to convert to constant 1929 prices, this being the ratio of current and real (1947 $) expenditures in 1929. The total of inventories thus deflated was multiplied by 1·092 which is the ratio of Abramovitz' total trade inventories in current $ in 1938 to the Department of Commerce estimate on their new basis. In the case of the series for consumers' expenditure the Dept. of Commerce estimates in 1947 prices (S.C.B. July 1947 and May 1958) were converted to 1929 values by dividing by 151·5 and were multiplied by 1·04 which is the ratio of the average of the Kuznets series to the Dept. of Commerce series for 1929/38 (In 1929 prices). The marginal inventory sales ratio for 1951/57 uses the new Dept. of Commerce series for consumers' expenditures in 1954 prices. The inventory series is the Dept. of Commerce total in current values as specified above deflated by the implicit price index for consumption corrected, as before, by the B.L.S. wholesale price index ratio of 4th quarter to annual average.

check on the behaviour of inventories and sales since 1929 is available by using the Dept. of Commerce analysis of the inventory change by industrial group (net of inventory valuation adjustment).[1] Since the net inventory change is conceptually equal to the physical volume change in inventory multiplied by the average price for the period, an approximation to the physical change in inventory can be obtained by deflating the net change in inventories in current values by the implicit price index for consumption of manufactures. The series can then be cumulated using an arbitrary base. The relationship between trade inventories and consumption in real terms, so calculated, agrees fairly well with the relationship as calculated above the marginal inventory-sales ratio for the period 1935/42 being approximately the same. There is also agreement on the upward shift in inventories relative to sales from 1951 whilst the marginal inventory-sales ratio for the period 1951/56 is identical with the ratio as calculated from the deflated inventory series.

It can be seen from the above discussion that, although no single relationship can be made to cover the series from 1920-1957 there are three distinct periods, with stable marginal inventory-sales ratios, which, in the case of 1920/32 and 1935/42 are virtually identical. In the models the regression value of 0·194 (annual) has been used for these sub-periods and the value of 0·12 (annual) has been used for 1951/57. It will be noted that the procedure implies a 6 month lag between turning points of aggregate trade inventories and sales to consumers. Abramovitz gives the average lag of trade inventories (in constant prices) at business cycle turns, 1918 to 1938, at 5·9 months.[2] Foss and Holmes have stated that

> " The historical behaviour of retail stocks and sales indicates that retailers, like manufacturers, have characteristically adjusted their stocks to changes in sales only after a number of months have elapsed."[3]

In the case of the manufacturing sector the same authors have stated that

> " In general it was found that the level of inventories tended to change much more moderately than sales and that several months elapsed before manufacturers brought their stocks in line with a changed volume of sales. Analysis revealed that during the period 1926-40 the lag in adjusting stocks to sales averaged approximately 6 months ; it was somewhat longer in durable goods and a little shorter in nondurables."[4]

Using seasonally adjusted quarterly data in current values they demonstrate that the level of inventories can be predicted with substantial accuracy on the basis of previous sales using a lag of 2 quarters. The actual relationship given was

Inventories $= 3{\cdot}24 + 0{\cdot}54$ Sales of 2 quarters earlier (\$ bill.).[5]

The important feature of this equation is that it can be used to predict the level of inventories with substantial accuracy up to the end of 1942. For the war period of 1943/46 the relation fails, but from 1947/50 the data once again conforms substantially to the pre-war regression line.[6] The same sort of stability is revealed if year end data for inventories is related to average sales for the year. Using revised Dept. of Commerce data (unadjusted) for the years 1929/42 and 1947/50 the regression equation is

[1]See *e.g.* Dept. of Commerce, *National Income* 1954, Table 33 pp. 210–11.

[2]*Inventories and Business Cycles.* p. 104.

[3]Murray F. Foss and Lois E. Holmes, " The Trend of Inventories in the Mobilisation Period," *Survey of Current Business*, April 1951, p. 31.

[4]*Op. cit.*, p. 18.

[5]*Op. cit.*, pp. 18–19. They do not give any indication of goodness of fit. Using data kindly supplied by the Dept. of Commerce I find a correlation coefficient of 0·91. My own regression equation differs slightly from theirs, doubtless due to differences in the accuracy of working.

[6]See their diagram *op. cit.*, p. 19.

Year end Inventories = 3·24 + 0·54 Average quarterly sales for year ($ bill.)[1]

which is virtually identical with the equation resulting from the unrevised quarterly data. The correlation coefficient in this case has the astonishing value of 0·999. After 1950 there is a break in the relationship and actual inventories exceed predicted inventories by several billion dollars. There is some suggestion of a parallel shift to a new line but the dispersion of observations is substantial, especially in 1955.

In real terms the pattern is broadly similar to that described, but with greater dispersion around the regression lines. The quarterly data for 1926/40 when deflated give the following relation in 1947/9 prices.

Inventories = 9·75 + 0·41 Sales of 2 quarters earlier ($ bill.)[2]

with a correlation coefficient of 0·79. The annual data gives the relation (in 1947/49 prices)

Inventories (year end) = 10·18 + 0·39 Average quarterly sales for year ($ bill.)[2]

with a correlation coefficient of 0·98. The annual relation again reveals a break in the regression after 1950 but in the case of the deflated variables the values after 1950 are more definitely centred on a new regression line roughly parallel with the old one, but higher, at any level of sales, by some $5 bill. or approximately 13 per cent, on average, of the predicted value. If the regression line for 1929/42, 47/50 is raised by $ 5·2 bill. and used to calculate the value of inventories for the years 1951/57 the calculated values show a mean deviation of 2 per cent from the observed values with a maximum deviation in 1957 of 3·3 per cent. It has been suggested that the increase in inventories in 1951, which is explained substantially by movements in the durable sector, was a consequence of the impact of increased defence contracts on these industries.[3] Manufacturing inventories, like those in the trade sector, show a period of relative stability during the 1930's. The volume of inventories in 1947/49 dollars is 17·9 bill. 1932, 17·6 bill. 1933 and 1934, 17·3 bill. 1935. A partial explanation of this stability may be the effect of using an inaccurate price index, but, even allowing for this it seems probable that the inventory behaviour in this period was not normal. If manufacturing inventories are obtained by cumulating the deflated net inventory change from the National Income statistics[4] the general pattern remains unchanged but the inventory plateau of 1932/35 becomes less marked. Also the parallel shift of inventories after

[1]Series from *Business Statistics* (1957) pp. 14, 17 and *Survey of Current Business*, May 1958, p. S.4.

[2]In each case deflation was by means of the B.L.S. index of wholesale prices (all commodities) 1947/49 = 100. Inventories were deflated by average of prices in 4th quarter in the case of the annual regression line and by average of 2 or 3 months in the case of the quarterly regression line. Application of the Durbin-Watson test shows that positive serial correlation of the residuals cannot be rejected in either the annual or the quarterly relations. Use of the Orcutt-James test (G. H. Orcutt and S. F. James " Testing the Significance of Correlations between Time Series" *Biometrika*, vol. 35, pp. 397.ff) shows that the regression coefficient in the quarterly relation is significant at about the 6 per cent level. In the case of the annual relation the Orcutt-James test was inoperative. Examination of the deflated quarterly data suggests that the inventory-sales lag is nearer 3 quarters than the 2 quarters suggested by Foss and Holmes (*Op. cit.*, p. 31). It is not known whether their generalisation was based on current or deflated series. Abramovitz gives a lag for real manufacturing inventories relative to business cycle turns of 6—12 months (average 8·6 months) and suggests that the true lag is probably nearer to 6 months. His inventory-sales lag is given as 6 months on average for undeflated monthly data. (*Inventories and Business Cycles*, pp. 95, 97, 113). Since the process of deflation may exaggerate the length of the lag (Abramovitz, *op. cit.*, p. 97) and the lag is longer for durable goods (Foss and Holmes, *op. cit.*, p. 18), some of which may have little relevance for the inventory cycle, a lag of 6 months has been assumed as the standard for the models in the text.

[3]*Cf. Survey of Current Business*, March 1952 p. 5.

[4]*National Income* 1954, Table 33, pp. 210–11.

1950 is less evident whilst the observations become more difficult to reconcile with a stable marginal inventory sales ratio for this period. It is possible, however, that the newly revised figures for the inventory change by industrial group will modify this picture.[1]

We may conclude, for the manufacturing sector, that there is evidence of stability of the marginal inventory-sales ratio over substantial periods of time, the breaks in the relationship being related either to intense depression or to periods affected by war conditions.

In the case of the manufacturing sector, the marginal inventory-sales ratios just discussed cannot be utilised for the purposes of this paper since the estimate of sales involves some duplication. It is necessary therefore to get a relationship between inventories and consumers' expenditure on manufactured commodities. The difficulty of doing this is the existence of substantial parts of manufacturers' inventories which relate to producer's goods or construction materials. To examine the relationship between manufacturers' inventories and, say, G.N.P. less Services would probably give a misleading impression of the required value. The approach which has been adopted, therefore, is to consider aggregate manufacturing inventories against W. H. Shaw's estimates of output of manufactured commodities, destined for domestic consumption, in producers' prices. This gives an inventory-sales relationship which is free of duplication though it may not be strictly accurate for the consumer goods sector. When the data are used in terms of constant (1929) prices the following relation results for the period 1920/38.

Inventories $= 5{\cdot}355 + 0{\cdot}215$ Sales of finished commodities ($ bill.)

with a correlation coefficient of 0·85.[2] As the low value of the correlation coefficient indicates the regression line in this case is not nearly so clean as those already discussed for trade and manufacturing. For certain sub-periods e.g., 1924/1929 and 1935/37 it has been held advisable to use local incremental values of the inventory-sales ratio in the models discussed in the main text. In the case of the post-war II period the absence of any data comparable to that of W. H. Shaw for the inter-war period makes it impossible to estimate directly the required marginal inventory-sales ratio for the manufacturing sector. Since the regression line for manufacturing inventories and sales including duplication shows approxi-

[1] In the *Survey of Current Business*, July 1958, the total net inventory change (non-farm), adjusted for inventory valuation, for 1955 has been raised by some 38 per cent compared with the change as given in *Survey of Current Business*, July 1957, p. 5.

[2] The Durbin-Watson test yields a value of d of 1·138. This means that serial correlation of the residuals can be rejected at the 1 per cent level but at the 5 per cent level there is significant evidence of serial correlation. Application of the Orcutt-James test shows that the effective number of observations is 6 and with this value the "t" test shows that the correlation coefficient is significant at a level of 3·3 per cent. Sources of data used as follows: Inventories; Abramovitz *op. cit.*, p. 566 current values deflated by B.L.S. wholesale price index number (all commodities) converted to 1929 base (average of 4th quarter). This procedure was used in preference to Abramovitz' series in 1929 prices. The latter series gives a cleaner regression for 1920's but shows substantial deviations from the regression line in the 1930's. Abramovitz' price index number shows more violent fluctuations than the wholesale price index number, which does not seem reasonable. On pp. 91–2 (*op. cit.*,) he concedes that it may give too much weight to prices of purchased materials and goods in the earlier stages of fabrication. Shaw's estimates of finished commodities at producers (1913) prices were taken from *Value of Commodity Output since* 1869, Table 13. Each separate group (Consumer durables, Construction materials etc.) was converted to values in 1929 prices by means of its own implicit price index. The 5 groups were then aggregated. Since Shaw's estimates are of output, not sales, the final total was adjusted for the inventory change in the inventory series. Use of unadjusted data would not materially affect the results given above.

mately the same slope for pre and post-war years it has been necessary to assume that the value of the ratio used for the inter-war period is appropriate for the postwar years. This assumption may not be warranted, but even substantial changes in the inventory-sales ratio in manufacturing alone would have relatively little effect on the periodicity of the inventory cycle. In fact the insensitivity of the length of the inventory cycle to changes in the magnitude of the inventory-sales ratio would justify the use of extremely crude estimates. The reason for the use of the possibly over-precise regression estimates is to get as accurate an impression as is possible of the degree of stability of the inventory cycle models.

Employment Fluctuations, Labour Supply and Bargaining Power[1]

INTRODUCTORY

The following paper has (aside from this introduction) four parts. First, an evaluation of published figures of employment and, particularly, unemployment, in the light of the recent British recession.[2] This section, however, will also outline an alternative index to fluctuations in the employment, at least of the major group of wage-earners. The second part discusses, in the light of such material and in a more general way, the response, to changes in demand, of the labour supply in terms of the *number* of workers. It will assume a high degree of collective organisation, or at least of informal solidarity, amongst wage-earners themselves. The third part examines the supply curve of labour in *other* terms than numbers—especially, in terms of working hours. So that it incidentally comments on the post-war phenomenon of extensive overtime working. The fourth part contains some brief conclusions as to the effect, on the bargaining power of a highly-unionised labour force, of changes in a predominantly high level of employment.

One major issue of recent economic discussion has been the relation between the level of employment and the level of wages. And this issue has also been central to post-war economic policy, because the actions of various governments (particularly, of course, against inflation) have implied differing assumptions about the nature of this relation—about the effects

[1]Some of the research on which this study is based was incidental to a period of work with the Economic Division of the International Labour Organisation; which has, however, no responsibility for any —much less, all—of what follows.

[2]This develops some criticisms of recent official statistics of employment (together with those of wages and disputes) made by the present writer in a paper (*Official Labour Statistics in Great Britain and the Interpretation of the Current Labour Scene*) to the second conference on Business and Economic Statistics of the Royal Statistical Society in March, 1958. But since at the time of writing an approach with a view to the improvement of public labour statistics is under consideration by the Inter-University Industrial Relations Association, various detailed comments on these statistics will be neglected here as more appropriate to such a technical discussion.

of changes in the demand for labour upon labour's pressure for increased wages.

Interesting attempts have been made to illuminate this relationship by comparing the movement of wage-rates, either directly with the changing percentage of recorded unemployment over the pre-war and post-war years,[1] or with a measure of labour surplus or scarcity derived from balancing recorded unemployment against the availability of job vacancies.[2] The known degree of unemployment is thus a key variable in these analyses ; and this would appear a sensible approach, because the relative size of the "industrial reserve army" of unemployed must seem critical to the bargaining power of labour in general. However, the interpretation to be put on such comparisons depends very much on the significance of the statistics from which they derive. One point of this paper is to suggest that British statistical series which may, before the war say, have adequately reflected the trends both of the price of labour and of its relative surplus or scarcity, are now greatly changed in significance. Moreover, that this change results from important changes in the labour market itself, which have been mainly induced by the generation's relatively high employment which the British economy has experienced.

These changes in the labour market affect the validity of our available measurements not merely of unemployment and employment, but also of wages. However, in recent years wage-trends have received rather a lot of attention. This explains the present paper's prior concern with the significance

[1]A. W. Phillips, *The Relation between Unemployment and the Rate of Change of Money Wage Rates in the U.K.* (*Economica*, Nov., 1958).

[2]L. A. Dicks, — Mireaux and J. C. R. Dow, *The Determinants of Wage Inflation, U.K.*, 1946–56 (R.S.S., 1958). So far, such analyses have been made only for the post-war period. Statistics of vacancies, however, are available back to 1904.

—both statistical and theoretical—of recent trends in employment and unemployment.[1]

How Much Unemployment is There?

This question, of course, became prominent only in the late stages of the recent recession. From 1940 until 1956, everybody knew that, in most districts, those who wanted work could find it with little difficulty. So few were included to look critically at an official unemployment percentage that fluctuated, from 1948 until early 1958, between 1 and 2 per cent. of

[1]For the record, however, and since a major conclusion here is that we have at present no official indices which measure these trends adequately—in effect that we do not know what the true level of unemployment is—be it said that we do not know what the true price of labour is either.

Our main official series are the monthly Index of Rates of Wages, and the six-monthly census of earnings and hours. Neither of these include the growing cost of "fringe benefits," which by a recent enquiry (*Ministry of Labour Gazette*, August, 1957) now amounts to 7 per cent. on wages, and 15 per cent. on salaries. The Wage-Rate Index is now a very good one of its kind, but expresses mainly the result of those increases in wage-rates for the standard work-week which are arranged by "industry-wide" negotiations or awards. It thus excludes the effect of union bargaining for other improvements in pay—overtime and shift rates, guarantees to earnings, etc.—as well as of most increases in wage-rates (particularly for piece-workers) negotiated at the workplace level. These things are reflected in the six-monthly earnings average, but this excludes several important industries. The earnings average also reflects the result of changes in the age and sex composition of the labour force and of its distribution between industries: these things can be isolated (see F. A. Penrice, *LCES Bulletin*, Sept., 1952 and Dec., 1955, or the present writer, *Manchester School*, May 1956) but several other factors cannot. In particular we do not know how much of the residual increase in earnings is due to changes in the "skill-mix" of the labour force, in the geographical distribution of labour, in the output and earnings of pieceworkers, in the arrangement of working hours (and thus in the proportion of overtime, etc. payment)—and how much on the other hand is due to increases in wage-rates conceded by individual employers additionally to those included in the Wage-rate Index.

(A third official measure of wage-movements which is often quoted—the monthly estimate of the number of workers covered by, and of the addition to the weekly wage-bill from, reported increases in wage-rates—may be positively misleading, since it does not indicate the proportion of wage-earners on whom reports are normally receivable, although it is apparent that this proportion has considerably increased since the war).

In any case, we have as yet no comparable Index of Salaries, or census of salary-earnings. And since about a third of all employees are now salaried, their pay should obviously be included in any "wage-rate" index which is to be compared with *general* unemployment or employment fluctuations.

employees. It was well known that unemployment was very low. In the regions affected by the sharp textile recession of 1951/3, some doubt circulated of the unemployment registration's validity as a measure of the work lost at that time. But it was only when the registration climbed, in autumn of 1958, above the half-million mark—equivalent to an unemployment percentage of some 2¼ per cent.—that its value as an indicator became more widely questioned.

The level of unemployment is nevertheless one of the most widely-recognised tests of economic conditions—and of government policy. The British government's commitment to "full employment," for instance, is still officially expressed as one to prevent unemployment exceeding 3 per cent. at its normal seasonal peak. And the percentage of unemployment in particular districts provides the rule by which the government will allocate assistance and "incentives" to new industrial development.

It is some indication of the importance that has been officially and publicly attached to unemployment figures that these are among the most extensive, detailed and promptly published of all the labour statistics available.[1] But the contemporary value of all this material is somewhat dubious.

The reason for this is the post-war change in the labour market and the labour force. The figures of unemployment are, of course, derived from a "count" of the people registered at Employment Exchanges as unemployed on a particular Monday in each month. Probably the critical factor in determining whether unemployed people will sign on at the Exchanges—and will continue to do so regularly after they have first lost employment—is that this act is a condition of

[1]The *Ministry of Labour Gazette's* analysis of the registered unemployed includes not merely the regular calculation of the percentage they represent to the estimated total of employees, but a detailed division by industry and sex, by region (with a separate statement for each principal town), by broad categories of unemployed ("wholly" or "temporarily"), by duration of unemployment, and by detailed age-groups. It also includes special statements of unemployment in Development Areas, and among Disabled Persons and certain ex-service personnel, and an annual summary back to 1939. To these, it has recently added certain statistics of unemployment by skills and occupations. Most of these series are monthly for the previous month.

their drawing unemployment benefit (or National Assistance, if they have fullen back on that). Three classes of worker, however, are ineligible for benefit : married women who have opted (as the majority of them do) not to contribute to National Insurance : most workers over "retirement age" for National Insurance pension, who have a similar option : and contributors to National Insurance who are disqualified from benefit for any one of a variety of reasons (for instance, that they have left their work voluntarily).

The percentages of unemployment which are derived from this registration are not, of course, comparable with pre-war official percentages because these were calculated on an "insurable" population which was then much more restricted. An exact reconciliation of the pre-war and post-war percentages would be a rather elaborate calculation. But roughly, the intervening extensions of social insurance to the whole occupied population increased the insurable work force by half, and it can also be assumed that those excluded from the pre-war insured population were mainly salaried people who were little affected by unemployment. So that the 1939 unemployment index of 9 per cent. would have been, if calculated on the post-war basis, between 6 and 7 per cent. While the normal post-war unemployment percentage of around 1½, recalculated on the pre-war basis would have been over 2—and the index of 2·8 per cent. for January, 1959 would have become 4.

Nevertheless the pre-war registration was almost certainly a much more complete guide to the extent of unemployment among "insurable" employees. One reason for this was that in the presence of obvious mass unemployment, workers who lost their jobs usually did so by dismissal. In the post-war period of high employment, however, it has been much more common for people to leave their jobs voluntarily, thus disqualifying themselves from benefit. This period also encouraged a tendency, even of workers who were actually dismissed, not to register at an Employment Exchange immediately because they might then be sent to a job they did not like under penalty of forfeiting benefit, but instead to "shop around" for some time in hope of finding a place that suited them.

At any rate, the 1951 Census of Population returned some 445,000 people as "out-of-work" in April of that year : the number registered as "wholly unemployed" at the nearest monthly "counts" was less than a quarter-million. It is possible that some part of the difference was accounted for by workers who were sick (although the Census is supposed to report people "out-of-work" only if they are actually seeking it). But the fact that large proportions of the Census unemployed were men in engineering and building (where mobility and independence is encouraged either by craft traditions or by short-term employment) and women in catering trades (where labour is also singularly volatile) suggests voluntary resignation and "shopping around" to be the major explanation. In other words, little of Beveridge's allowed 1 per cent. of "frictional unemployment" may appear in the *normal* post-war unemployment registration.

It is important that such failures to register may by no means cease in recessions of the limited post-war type. Actual dismissal of labour these days is usually anticipated by a period of short-time, or at least of preliminary negotiation with the union representatives. It has been quite a common experience of firms going on to short-time that younger and more skilled workers then leave to look for other jobs. And several "redundancy disputes" have solved themselves by the workers affected having left before their notice expired—often to "beat the rush" of new work-seekers.

However, a much graver source of the official unemployment percentage's understatement in a recession is non-registration by married women and older workers. These, and particularly married women, have provided the reserve from which the very marked post-war expansion of the labour force has been recruited. In 1951 they composed some 15 per cent. of employed people—certainly a much greater proportion than before the war. And that proportion certainly increased during the boom of 1954/55. They are also, naturally, among the first to be dismissed in a recession. And that very many of them do not then register is pretty conclusively suggested by a comparison of the monthly changes in employment (as indicated by the returns of employers' payrolls to the Ministry of Labour)

and in unemployment, as well as by these statistics' general behaviour during the recessions of 1951/52 and 1955/59.

At time of writing, for instance, the last available published total of jobs nominally occupied is for end-November, 1958, when "civil employment" and "forces" together stood at some 23,600,000.[1] For that date, the Ministry estimated the register of "wholly unemployed" to be about 483,000.[2] Since the previous peak of the labour market seems to have been about November, 1955,[3] it is convenient to trace the changes in these two figures over the intervening three years. In fact, this is not too easy, because the monthly payroll-figures are revised annually by an estimate from a sample of social insurance records, and the exact comparability of the separate years' figures so revised seems a little uncertain.[4] Only in the last year (1957/58) are consequential discrepancies between the figures so small as to permit reasonable confidence in any purportedly-precise calculation of employment trends over more than a few months. However, one can at least avoid the effect of the annual revisions by working year-to-year on the payroll adjustments alone. As follows : [5]

End-November	Fall in Employment (000's)	Rise in "wholly unemployed" register (000's)
1955/56	92	56
1956/57	215	49
1957/58	306	168
Total change 1955/58	—613	+273

[1]"Civil Employment" includes employers and self-employed, the number of which is not separately stated. It is believed, however, that the Ministry does not change its estimated figure for these categories from month-to-month.

[2]The "temporarily stopped" are assumed to be included in employers' payrolls and therefore appear in the employment total as well as the unemployment percentage. They raise separate problems, which are referred to later.

[3]See Table I on page 186.

[4]In particular, it seems possible that the annual estimate may be affected by "fringe" entries into the National Insurance scheme, since discrepancies seem to have diminished over time.

[5]From the *Ministry of Labour Gazette* for January, 1957, 1958, 1959.

So that some 340,000 payroll-jobs apparently disappeared without their loss (equivalent to some 1·6 per cent. of unemployment) being reflected in the unemployment registration.

In these three years, payroll-jobs occupied by women fell by about 260,000—so that women's loss of employment was quite disproportionate to their number in the total labour force, just under a third of which was female in 1955. On the other hand, the number of women registered as "wholly unemployed" rose by only 64,000. Of course, this does not necessarily mean that 200,000 women fell out-of-work without registering. Many would certainly have retired from the labour market for quite other reasons than its depressed state ; but other women, who would formerly have been recruited to replace them, now had no opportunity of taking up employment. Indeed the number thus affected was probably greater than these figures would suggest, because up until 1955 there was a steady annual addition to the working population—about 100,000 or so—from married women returning to employment, and there was then no indication that this process had reached its limit.

Over the same three years the loss of payroll-jobs for men was about 350,000, compared with an increased male "wholly unemployed" registration of 210,000. In their case, the difference would be partly accounted for by the retirement of men over pensionable age who would otherwise have stayed on at work. (It was notable that the number of National Insurance "retirement pensioners" rose beyond expectation in 1958). However, a factor affecting the degree of "concealed unemployment" among both men and women was that at this time the 1940's birth-rate "bulge" was beginning to emerge as an increased juvenile entry to the labour market ; over the three years 1956-58 again, this increase probably amounted to some 100,000. And since juvenile unemployment rose only by 10,000 or so, the additional young people must also have found employment by displacing other workers.

To judge by payroll-trends, then, in November, 1958, there were at least 430,000 and perhaps over half-a-million people, mostly married women or elderly, who would, had it not been for the recession, have been in employment, but were in fact not—and were not registered as unemployed. If one supposes that no

more than an additional 100,000 people "out-of-work" were unregistered for other reasons, the total of such "concealed" unemployed would have represented between 2½ and 3 per cent. of employees. And had the official unemployment percentage—2·4 at 8th December, 1958—been compiled by a method like that of the U.S.A., which picked up such people, it would probably have been more than doubled.

It is useful to draw a rough distinction between "primary" and "secondary" members of the labour force—i.e. between those workers who depend on paid employment or on unemployment relief, and those who have some other support.[1] The deficiency of the unemployment registration as an index to post-war fluctuations in employment is thus largely attributable to the greatly increased proportion of "secondary" workers in the labour market.

This raises the question whether the level of employment itself would not be a better guide to such fluctuations than would the unemployed registration. For such purposes as the allocation of public incentives to local industrial development—or even as a test of "full employment"—the proportion of the population occupied or attending full-time education would certainly be a better standard. In general, however, use of the level of employment as an alternative indicator involves a difficulty created by another feature of the post-war labour market.

The extension of the National Insurance scheme has permitted the construction of more extensive employment statistics than were available before the war. However, these statistics really represent only the size of employers' payrolls. And the experience of post-war recessions has been that it is now much less usual for "primary" workers, at least, to be dismissed. This is partly because memories of protracted labour shortage, combined with government promises to maintain high employment, make employers reluctant to lose labour that they may later find it hard to get back. Particularly, it is due to the

[1] These terms adapted from R. C. Wilcox, in "The Measurement and Behaviour of Unemployment" (*Report* of conference of the *Universities—National Bureau Committee for Economic Research*, U.S.A., 1957).

increased strength of the unions, whose members (if not always their leaders)[1] resist "redundancy."

Thus, a very normal reaction to a falling-off in trade is to organise some form of "work-sharing." A common way to do this is to work short-time (alternate weeks, three or four days in the week only, "short days," etc.). Some of those affected by short-time may sign the unemployed register as "Temporarily Stopped," together with workers stood-off for more indefinite periods. And in our 1951/2 recession this register rose considerably more than that of the "Wholly Unemployed" itself. But the greater part of such workers do not register—they may be ineligible for unemployment benefit, or not losing enough time to qualify, or under collective agreements or "fall-back wage" schemes (like those of the docks) that prevent them claiming, or working on the single day of the unemployment "count," and so on. 71,000 people registered as "Temporarily Stopped" in January, 1959; but of operatives in manufacturing alone, at least 172,000 were reported to be on short-time.

Since 1951, the *Gazette* has published some separate quarterly statistics of short-time (and overtime) working, and recently these have been supplemented by a monthly estimate. They are certainly a more sensitive index to the work level than either the unemployment percentage or the employment statistics, but are rather simple and limited—to broad manufacturing trades only, and excluding certain groups of workers in them.

But short-time is, in any case, only one form of "work-sharing." The post-war reductions in the standard working week led to no parallel reduction in actual average working hours. It can be estimated from the quarterly returns that over 5 per cent. of the work done by manufacturing operatives was in 1955 paid as overtime. And it would appear from other sources (the Ministry's half-yearly census of average hours in

[1]There has been a division in the unions on this issue. Rank-and-file leaderships have usually opposed dismissals, attempting to enforce "work-sharing" by strike action. Some union executives have been prepared to accept "redundancy" subject to compensation for those discharged. But since this penalises dismissals too, it also encourages "work-sharing" as an alternative.

certain industries) that overtime is considerably more extensive in non-manufacturing trades. With regular overtime as a normal and large element in wages, to cut it is an obvious alternative to short-time.

The overtime statistics suffer the same limitations as those of short-time, and are also less frequent. From the combined quarterly return of short-time and overtime and from other sources, however, one can make an estimate of the total hours worked by operatives in manufacturing industry.[1] The calculation is displayed in Table I. This shows—for instance—that, over the three years of the present recession from November, 1955, total operative-hours fell by some 7 per cent. But the total payrolls of manufacturing operatives fell by only 5 per cent. ; so that had it not been for short-time and reduced overtime in manufacturing alone, the national employment level would have been nearly 1 per cent. lower in 1958 (and the national percentage of unemployment considerably higher).

There are, of course, other ways of "work-sharing," which are generally unrecorded. To reduce the work-allocation of pieceworkers is very usual in some trades. Especially important, perhaps, is the practice of "extended holidays." The reason for this is not only that very many workers affected by it will be barred by agreements and insurance regulations from unemployment benefit and so not register, but that since firms have to stop for holidays anyway, they try to put off stopping for *other* reasons till then. The extension and "staggering" of paid summer holidays, in particular, thus makes the period over which these are now spread both that in which a recession is

[1]The method of this estimate is proposed in detail in an Appendix to the present writer's *Measuring Unemployment* (*Journal*, R.S.S., Series A, Part I, 1955). It is probable that Table I understates the proportions of both short-time and overtime, and thus not only their "Equivalent" in column 7, but the fluctuation in total operative-hours. This is because data is limited or not available on such things as the actual length of the average *standard* week, the extent to which nominal payrolls are fully effective, and so on. However, the difference that would be made to the final indices of Table I by making proper allowance for such things does not justify an attempt to estimate them speculatively.

Recent payroll-figures in manufacturing seem, incidentally, less affected by annual revisions than do those for employment as a whole.

TABLE I

"TRUE EMPLOYMENT" IN BRITISH MANUFACTURING INDUSTRY

Week ending:	Short-time			Overtime			Balance of short-time and over-time "Equivalents" (%)	Operatives employed, estimated (000's)	"Equivalent" at standard week (000's)	INDEX (Sept. 1951) as 100	
	Operatives on (%)	Average hours of	"Full-time Equivalent" (%)	Operatives on (%)	Average hours of	"Full-time Equivalent" (%)				Total operative-hours	De-seasonalised
	1	2	3	4	5	6	7	8	9	10	11
30 June 1951	0·6	11·8	—0·2	21·6	7·9	3·8	3·6	7,180	7,440	99·2	100·2
22 Sep. 1951	1·1	12·8	—0·3	21·8	7·8	3·8	3·5	7,250	7,500	100·0	99·6
26 Jan. 1952	3·7	12·9	—1·1	19·9	7·7	3·4	2·3	7,290	7,450	99·3	98·7
24 May 1952	5·4	17·1	—2·1	20·8	7·7	3·6	1·5	7,130	7,240	96·5	97·9
30 Aug. 1952	3·3	16·3	—1·2	20·2	7·8	3·5	2·3	7,070	7,230	96·5	97·5
29 Nov. 1952	1·8	12·5	—0·5	23·1	7·7	3·9	3·4	7,110	7,350	98·0	97·6
28 Feb. 1953	2·0	10·8	—0·5	22·1	7·7	3·8	3·3	7,110	7,350	98·0	98·4
23 May 1953	1·1	10·9	—0·3	23·7	7·8	4·1	3·8	7,160	7,440	99·1	99·4
29 Aug. 1953	0·5	11·4	—0·1	23·6	8·0	4·2	4·1	7,220	7,520	100·2	100·4
28 Nov. 1953	0·5	11·0	—0·1	26·5	7·9	4·6	4·5	7,340	7,660	102·2	101·3
27 Feb. 1954	0·7	11·0	—0·2	24·9	7·9	4·4	4·2	7,330	7,630	101·8	102·1
29 May 1954	0·7	10·6	—0·2	26·5	8·1	4·8	4·6	7,340	7,680	102·4	102·8
28 Aug. 1954	0·6	11·9	—0·2	25·9	8·0	4·6	4·4	7,420	7,750	103·3	103·6
27 Nov. 1954	0·5	12·0	—0·1	28·5	7·9	5·0	4·9	7,520	7,890	105·2	104·3
26 Feb. 1955	0·7	13·6	—0·2	27·1	8·1	4·9	4·7	7,520	7,870	105·0	104·7
28 May 1955	1·0	13·7	—0·3	26·5	7·9	4·6	4·3	7,500	7,820	104·3	105·1
27 Aug. 1955	0·9	14·8	—0·3	26·3	8·2	4·8	4·5	7,530	7,870	104·9	105·3
26 Nov. 1955	0·6	11·0	—0·2	30·0	7·9	5·3	5·1	7,610	8,000	106·6	105·3
25 Feb. 1956	1·1	11·4	—0·3	26·2	8·0	4·7	4·4	7,580	7,910	105·5	105·0
2 June 1956	1·7	11·1	—0·4	25·9	7·9	4·5	4·1	7,480	7,790	103·9	104·5
25 Aug. 1956	1·9	12·1	—0·5	23·6	8·0	4·2	3·7	7,470	7,740	103·2	103·7
24 Nov. 1956	1·2	9·0	—0·2	26·9	7·9	4·7	4·5	7,460	7,790	103·9	103·1
23 Feb. 1957	1·8	9·6	—0·4	24·9	7·7	4·3	3·9	7,370	7,660	102·1	102·7
1 June 1957	1·1	10·1	—0·3	26·3	7·9	4·5	4·3	7,330	7,650	102·0	102·7
31 Aug. 1957	0·6	11·4	—0·2	25·7	8·0	4·6	4·4	7,370	7,690	102·5	102·8
30 Nov. 1957	1·0	11·2	—0·3	27·6	7·8	4·8	4·5	7,480	7,810	104·2	102·9
1 Mar. 1958	1·7	12·9	—0·5	24·8	7·7	4·3	3·8	7,350	7,630	101·8	102·3
24 May 1958	3·8	13·9	—1·2	21·3	7·6	3·8	2·6	7,260	7,450	99·3	100·0
23 Aug. 1958	2·8	13·8	—0·9	21·1	7·8	3 6	2·7	7,220	7,410	98·8	99·1
22 Nov. 1958	2·8	12·2	—0·8	24·2	7·6	4·1	2·3	7,200	7,450	99·3	98·1

The "Full-time Equivalents" of columns 3, 6 and 7 represent the proportions by which the number of operatives would have to be reduced or increased were all to work exactly the standard week, and there were neither short-time nor overtime.

likely to reach a critical point, *and* that when all available work statistics become least reliable.[1]

However, to estimate these things is rather a speculative venture, and the measurements of Table I will suffice for present purposes. Two important points shown by Table I are the extent to which "work-sharing" constitutes an alternative to actual dismissal of labour, and the long-run stability and growth of overtime working. Thus in the first onset of both the 1951/52 and 1955/56 recessions, it will be seen that the major effect is a reduction in working hours (column 7) : in 1951/52, indeed, operative payrolls actually continued to rise for a while (thus giving a completely misleading picture of the true employment trend) even though *total* hours worked (columns 10 and 11) were falling. Thereafter, however, *average* working hours begin to rise again, though both operative payrolls and *total* working hours continued to decline. This suggests that for many "primary" workers, the normal working week is now considered to include a regular proportion of overtime. And that the reduction of working hours is generally regarded as a temporary measure, to stall off dismissals (or resignations) of such employees until the running down of the labour force by the discharge (or normally-high wastage) of "secondary" workers permits firms to again offer full employment to their "primary" workers.

The situation of salary-earners in a recession is in very marked contrast to that of wage-earners. The Ministry of Labour has not, so far, published the results of its annual enquiry as to the number of "staff" employees in manufacturing industry, but returns from the N.W. Industrial Region have been made available to the Economic Research Section of Manchester University. These show proportions of such salaried workers that seem, from other material, to be broadly

[1]See *Measuring Unemployment* (op. cit.) for an estimate of all such concealed forms of unemployment or underemployment in the 1951/52 recession. In summer 1951/2, all the published series suggested employment to be recovering : it was in fact declining. On the other hand, since the post-war increase in the manual worker's usual paid summer holiday from one week to two, it also seems to have become quite common for lower-paid people to work part of their holiday period (receiving holiday pay as a bonus) in busy times.

representative. From them, one can thus estimate the national movement of salaried employment in manufacturing, and compare it with the estimated payrolls of operatives shown in Table I. As follows :

TABLE II

PROPORTION OF "STAFF" TO "OPERATIVES" IN BRITISH MANUFACTURING INDUSTRY 1951-58

Oct./ Nov.	Total Operatives (000's)	Total Staff (000's)	Ratio, Staff to Operatives (%)
1951*	7,250	1,260	17·5
1952	7,110	1,400	19·6
1953	7,340	1,410	19·3
1954	7,520	1,480	19·6
1955	7,610	1,580	20·7
1956	7,460	1,640	22·0
1957	7,480	1,680	22·4
1958	7,200	1,710	23·7

*Sept./Oct.

It is well known that salary-workers do not significantly experience reduced earnings from short-time, scaled-down piecework allocations, and so on. Table II shows that not merely have salaried payrolls not fallen in recessions—although manufacturing was harder hit than the rest of the economy. They have actually continued to rise. (And it has been noted that, although perhaps a third of all employees are now salaried, salaries are excluded from the indices of wages which are usually referred to in estimating the wage-effects of employment fluctuations).

But perhaps the most interesting point of Table II is the actual manner in which the ratio of staff to operatives changes over the period. The general rise in this ratio has been attributed to technical development which transfers human work from the bench to the design office and laboratory. But "staff" also includes administrators, supervisors and clerks. As might be expected from the fact that salaried employees are not dismissed when operatives are, the staff ratio rises most sharply in years of sharpest recession in operatives' employment—1952, 1956, and again in 1958. But it does not seem to fall back significantly when operatives' payrolls re-expand, but instead to continue

to rise from the ratio established by recession itself. This suggests the growth of salaried employment may—even in industry—partly represent a variant of Parkinson's Law. So that the effect of contemporary recessions may be actually to increase the demand for salaried labour !

We see, at any rate, that the customary series of employment and unemployment have become inadequate because of the great post-war change in the labour market's character. It seems doubtful, indeed, whether any statistical series can now measure unemployment (including under-employment in its various forms) which does not derive, like that of the U.S.A., from a direct sample enquiry. Indeed, the accepted criteria of employment policy may well require revision in the light—other considerations apart [1]—of the reliability of the statistical indicators to which they relate.

The factors which have made this change include the effects of official "full employment" policy itself, of the greater proportion of salaried employees, of the increased strength of trade unions, and of such more recent collective agreements as those on the standard week, paid holidays, wage-guarantees and redundancy. But they particularly include the increased participation of "secondary" workers in the labour force, and the modern flexibility of actual working hours. These things we can now proceed to analyse more theoretically.

The Supply of Labour : Bodies

In discussion of the effect of changes in the demand for labour upon its bargaining power, the supply of labour is often treated as if it were fixed—so that a fall in employment will be neatly reflected in an equal increase of unemployment. But it will now be clear that this is very far from being the case.

The demand for labour affects its supply in at least three ways. First, via the level of wages directly. The alternative to offering oneself for paid work is by no means starvation for all those who would be socially and otherwise acceptable for employment. Even in highly industrialised countries, where no other means of livelihood than paid employment is accessible to the overwhelming majority of breadwinners and young adults, there

[1]See, for instance, p. 194.

remains a substantial fringe of potential workers—the "secondary labour force"—whose actual desire for paid work will depend on the latter's attraction relative to that, for instance, of a useful domesticity or a leisurely if penurious retirement. It has already been estimated that in the United Kingdom at the present time about a sixth of actual "employees" are either married women or people over retiring age for social insurance purposes. On the other hand, one can also estimate that about a third of all women who marry do not later return to work, and that nearly half the people reaching "official" retirement age do in fact retire.[1] And that it is at least officially considered that the employment of such workers could be increased is shown by the fact that the government has a special committee to promote the employment of older people.

A change in the demand for labour will affect the level of real wages, and thus the willingness of the "secondary labour force" to work. But the effect is not simple, because whether—for instance—a rise in wages induces an increase or a reduction in the supply of labour will depend at least partly on *existing* real wage levels. Such evidence as we have suggests that, for a given population of a given demographic composition, the supply curve of labour is shaped rather like diagram opposite.[2]

Thus at point *A* on the curve, wages are at bare subsistence, and everyone who can must work to live. So that rising average wages between points *A* and *B* lead to the withdrawal of children, wives and old people from the labour market. At *B*, however, purchasable or socially-provided services become available to substitute the unpaid domestic labour of women—particularly in looking after children—so the supply of labour rises again as housewives are freed for paid work. But at point *C*, this effect is overhauled by that of the raising of the average age to which education is prolonged—something that also accompanies rising living standards. So that the supply of labour falls again.

[1]See *Measuring Unemployment* (op. cit.)

[2]For a recent theoretical discussion of the "S-shaped" supply curve of labour, see Giovanni Demaria, "Aggregate and Particular Labour Supply Curves" (in *The Theory of Wage Determination*, J. T. Dunlop, ed., 1957).

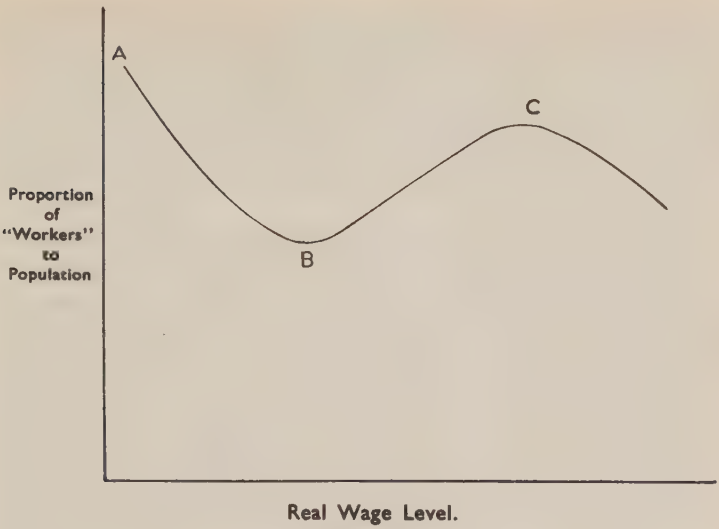


Figure 7

Another factor determining the special shape of the labour supply curve may be the changing attitude to material consumption at different real income levels. For a population so poor that every member of the family with the barest physical capacity for it must be sent to work, the immediate pressure is to establish a minimum of decent family and social life, so that increasing real wages are taken out in devoting more time (mainly of members of the "secondary labour force") to that necessity. Once that is established, however (point *B* again), and possible wage consumption begins to include not merely domestic labour-saving conveniences, but a significant and desirable luxury element, improvement in material standards has priority over say, keeping one's wife at home. But later (anyway, after point *C*) further increments of purchased luxury begin to have a lesser value than their equivalent in time—not necessarily for the "primary" worker's immediate leisure, but in terms of what the secondary labour might be doing if it were *not* working.

The exact level of real wages at which points *B* and *C* will be reached by any given population, as well as the curve's flexion in its case, will thus depend to some extent on its

valuation of material wealth against less tangible desirables. And within a population, groups of different income levels will be at different points on its particular curve. Nevertheless, the evidence is that in Western industrial countries, the population as a whole is still between points *B* and *C*. So that an increased demand for labour increases its supply. We might call this "Employment Effect One."

The second effect of labour demand upon labour supply depends upon the relative scarcity or surplus of labour itself. It also follows from "Employment Effect One" that (so long as the total demand for labour is sufficient to employ all the "primary" workers) a *reduced* demand for labour which resulted in a fall in real wages would simply lead to a withdrawal of "secondary" workers from the labour market. So that, above that particular level of employment, *un*employment (apart from a minimum of "frictional" unemployment) can only persist in one circumstance—that real wages are prevented from falling. But this is precisely what trade unions, legal minimum-wage laws, state social insurance schemes, etc. aim to do. And since the effect of maintaining real wages at a level which is artificially high in face of a restricted demand for labour is to induce "secondary" workers to compete for jobs with "primary" workers, society has also devised methods of reserving the available jobs to the latter.

These restraints upon the demand for (and hence the supply of) secondary labour include legal and institutional limitations of various kinds. For instance, the raising of the school-leaving age has been pressed by trade unions to keep young workers off the market as well (if not as much) as for social reasons, and state inducements to retirement have served a similar function in relation to older people. Again, the restrictions on entry operated by many unions and professional bodies, and the obligation to retire still characteristic of many employments, although primarily aimed to protect the standards of particular occupations, also increase labour competition for jobs which are not so protected (and which are also generally the only ones that "secondary" workers are permitted to enter), thus relatively depressing wages for such jobs and reducing their attraction to secondary labour. But these restraints also

include conventions, prejudices and traditions which may not merely discriminate against the employment of secondary labour (by excluding women from large areas of employment, for instance), but may influence the secondary workers themselves against desiring work when jobs are scarce. So that married women, for example, may feel it unfair to seek jobs when men are unemployed.

Such social inhibitions of the labour force will, of course, depress the general labour supply curve—particularly, they will flatten its slope from points *B* to *C*. When work is scarce, they tend to become more strict. They relax when work is plentiful. But since, from their nature, they are only slowly responsive to changes in labour's market situation, their tightening *or* relaxation is likely to be more marked when employment is relatively stable, at a low or high level respectively. Thus, a protracted period of high labour demand, such as most Western countries have recently experienced, will itself induce an expansion of the labour supply. And this expansion will be especially pronounced when (as in the Western case) the phase of high employment follows a similar long period of general labour surplus. Call this "Employment Effect Two."

This brings us to the third interdependence between labour demand and supply, which depends just upon the *stability* of demand for labour. The downturn of the general labour supply curve (at point *C*) may be postponed by changes in social values—wrought by consumer advertising, for instance. But the supply of labour, between points *B* and *C* at any rate, may also be increased without changing either the curve's general shape, or the *average* purchasing power of wages. Sharp fluctuations in the demand for labour invariably lead to considerable fluctuations in the individual earnings of employed people themselves. For wages, they increase what Friedman has called the "transitory component of income," as against the latter's "permanent component."[1] While a relative stability of employment has the opposite effect. Now a stable income is more desirable than a fluctuating income of the same

[1]Milton Friedman: "A Theory of the Consumption Function," (Princeton, 1957).

average amount. Thus a period of relatively stable labour demand, of whatever level, virtually increases the worth of the average real wage, and thus raises employment's attraction to secondary workers. They will offer themselves for steady work : but not for casual or uncertain labour that yields the same total income. So again, the character of labour demand influences its supply. Call this "Employment Effect Three."

This account of labour supply's responsiveness to its demand is necessarily terse ; it neglects several no doubt desirable refinements and certain interesting implications.[1] Nevertheless, it cannot be doubted that recent high employment in Western economies has induced a general expansion of the labour force : certainly, in the British case, this expansion is mainly attributable to such "Employment Effects" as those here described, since demographic changes and net immigration have contributed relatively little to it. Up to the last year, indeed, the latter have had a quite insignificant effect on the total labour force. But since 1948 what is officially described as "the total working population" (which includes the *registered* unemployed) has nevertheless risen by 1,400,000—or some 6 per cent. Over half this came from an increased employment of married women, and a substantial part from the re-employment of retired people.

The implication, of course, is that "full employment" (granted that it is associated with rising real wages) does not mean a particular level of *unemployment*, but a rising *employment*. If the response of Employment Effects One, Two, and Three to changes in the demand for labour were prompt and precise, indeed, one would expect the percentage of "unemployed" to stay constant when employment fluctuated. Employment fluctuations would be mainly reflected in withdrawals from or re-entries to the labour market by secondary workers, rather than in open and notified unemployment. "Full employment" would, however, involve a declining

[1]For instance, if one were considering an under-developed rather than a developed economy, in which "Employment Effect One" were reversed (the population being between points A and B on the supply curve), so also would be Employment Effects Two and Three. Employment Effect Two, however, would apply normally if, instead of real wages being maintained at an artificially high level, employers (and the state ?) were combined to keep them at an artificially low one.

employment after average real wages had risen past point C on the supply curve.

THE SUPPLY OF LABOUR : HOURS, ETC.

The supply of labour has several dimensions, of which that of the numbers is only the most obvious. Other dimensions include those of effort, quality, and working hours. Of these, only the last is readily measurable.

There seems to have been some disagreement amongst economists on the supply function of working hours. Pigou and Knight thought that a fall in wages would lead to an increase in working hours and a rise in wages to less work. Robbins and Paish have argued (though with rather different reasoning) that this is not necessarily true, and that the supply of hours might well rise with wages, or fall when wages decreased.[1] These disagreements might be resolved if the supply curve for hours were "S-shaped," like that for bodies—so that whether rising wages induced an increase or reduction in working hours depended on the level of wages from which the rise occurred.

There is some evidence that the supply of labour in terms of average working hours does follow a similarly-shaped curve to that for numbers. Though, of course, the various slopes of the two curves may differ—as may, particularly, the levels of wages at which they reach points B and C. This last difference, in fact, may occur because the supply curves for hours and numbers are connected via family income : if one wants more money, but has already sent one's wife and father out to work, then the only thing to do is to work longer hours oneself. Similarly, a man may be obliged to work overtime because he wants to keep his children at school longer. So that point B on the hours supply curve might be reached at the same level of wages as point C on the supply curve for numbers.

In the inter-war period, and certainly before that where workers were well-organised, normal working hours in British manufacturing were pretty closely regulated to the standard week of union agreements. And since, by collective bargaining,

[1]For a recent theoretical discussion see "A Theory of the Responsiveness of Hours of Work to Changes in Wage Rates," by F. Gilbert and R. W. Pfouts (*Review of Economics and Statistics*, May, 1958). This favours Pigou's conclusion.

the standard week was reduced, both around the turn of the century and again after the First World War, considerably below the maxima already established for major trades by law, average working hours also fell. But the general reduction to a 44 or 45 hours standard that followed the Second World War had a different effect. The agreements embodying it were made at a time when the demand for labour was actually recovering from the immediate post-war re-adjustment. And the unions' subsequent neglect of the standard week's regulative intent (Employment Effect Two, again) has apparently combined with relative labour scarcity to give individual workers much more freedom to determine their own working hours.

Thus average working hours reported for men actually rose from 46 in April, 1947, to nearly 49 in 1955—a level then substantially above the men's pre-war average. And that this was not entirely due to the attraction of extra rates for the average three or four hours of overtime this implied is suggested by the quite different post-war history of women's working hours. Their reported average has stayed pretty firmly at just below 42 since 1947—in their case considerably below the pre-war figure. And there is so little variation between women's average hours in different sections of industry that one suspects that to them the standard week itself now acts as an onerous and enforced minimum.[1] So that, so far as hours are concerned, women generally appear to have passed point C on the supply curve.

[1]It is perhaps relevant that, when part-time shifts were introduced by textile manufacturers to help meet post-war labour shortages, employers' federations were obliged to bind their members not to accept the women who then abandoned full-time work in other firms. In fact, even the relative stability of women's working hours at their lower post-war level is statistically exaggerated by the official manner of presenting the six-monthly "Earnings and Hours" inquiry's results, since it counts part-time workers as halves in computing the averages for women. Part-time employment for women (see *Ministry of Labour Gazette*, Dec., 1958) has significantly increased in the post-war period, so that the actual average working week of women wage earners has continued to decline. And since the average hours per week of part-time women workers were in fact more than half those of full-timers, the decline affected the latter as well. Their hours in point of fact fell from 41·4 in Oct., 1948 to 40·9 in April, 1958—a reduction corresponding pretty closely to the minor reductions in the average standard week meanwhile.

By contrast, for men again, not only have hours worked increased on the average, but their range has considerably widened when compared with the pre-war spread of hours between trades. If one looks at the average hours reported for men in different sectors of industry by the Ministry of labour's six-monthly census, one finds that these are pretty closely, but inversely, correlated with average hourly earnings. So that the higher the actual hourly wage, the shorter the actual working week.[1] However, the range has also tended to narrow again in recent years—between the 1951 and 1955 employment booms, for instance, reported average hours in a handful of well-paid men's trades rose from below standard to above it. So that, on their hours supply curve, men would appear to be only just passing point B.

Table I (see page 186) throws an interesting light on this process. In this connection, its most remarkable feature is that the increase in average hours worked over the period 1951-58 has occurred, not via an evenly spread rise in working hours, but by an increase in the *proportion* of workers (Col. 4) performing an average period of overtime which has itself remained remarkably constant (Col. 5). So that fluctuations in employment have affected the number on overtime, rather than the extra hours each overtime worker puts in. It will be seen that although the proportion of manufacturing operatives on overtime rose from about a fifth to nearly a third between the two employment peaks of 1951 and 1955, the average hours of overtime those working it actually performed remained very stable at about eight hours per week.[2]

A possible explanation of this would be that, with most manufacturing operatives on a five-day standard week, overtime normally took the form of an extra day's work per week. But there is too much variation in the average hours of overtime

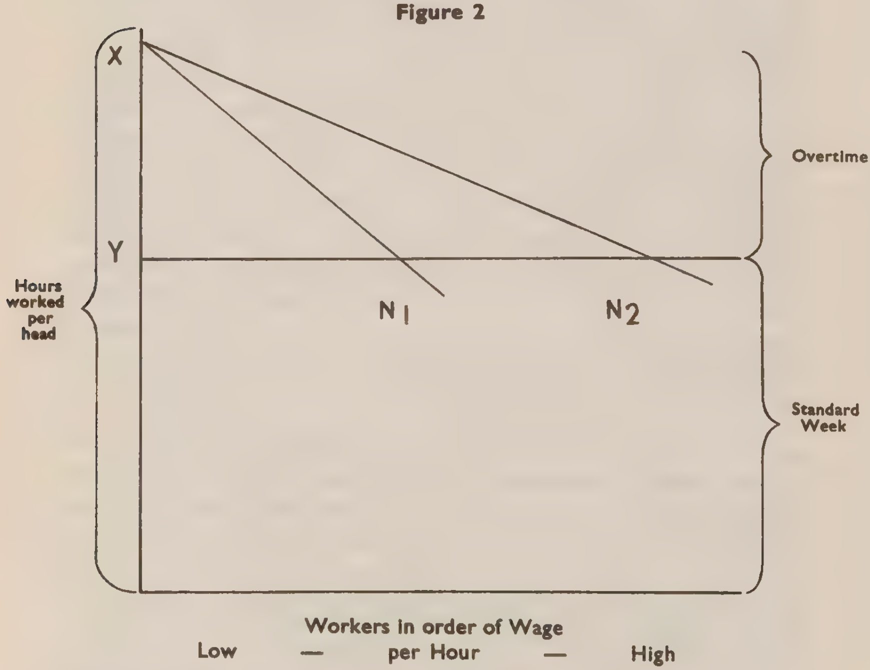
[1]In fact, a ranking of industrial sectors by average hours, compared with their ranking by average hourly earnings, yields for Oct., 1955 (the most recent peak in employment) an inverse correlation of 0·68.

[2]There is perhaps a very slight rise in this average over the whole period, but this would again correspond to the effect of continued minor reductions in the standard week, which here raised the proportion of working hours paid as overtime. It thus does not represent an increase in the *total* hours put in by each overtime worker.

reported for different trades to be consistent with this alone. In manufacturing, they currently run from 4½ to 9 hours per overtime worker, and although no direct return of overtime is made from non-manufacturing trades, it is clear from average hours worked in some of these—road haulage and building materials, especially—that their normal period of overtime must be very much longer.

However, there is another explanation of the stability the average period of overtime displays, despite the unsteady rise in the proportion of operatives working it. This is exactly the effect one would expect if the *lowest* paid workers were already doing as much overtime as was physically and technically possible, but willingness to work overtime was spreading up the wage scale—viz :

Figure 2



Between N1 and N2, both the number of workers on overtime and the latter's total amount will have increased, but

the average overtime hours worked by each overtime worker will remain the same, being equal to $\frac{XY}{2}$ in each case.

On the other hand, temporary reductions in overtime working, made to spread jobs during a recession, generally take the form of its cancellation by individual establishments. And this affects the latters' operatives indifferently of whether they are higher or lower-paid. So that although the total number of operatives working overtime declines, the average extra hours of those still working it stay the same.

Summarily, one might put it that average hours have been rising because, although women have passed the downturn (at point C of Figure 1) on their hours supply curve, this has been much more than offset by men passing the upturn (at point B) on theirs. In the men's case, this represents a combined result of what were called "Employment Effects One, Two, and Three"—respectively expressed here as a lower preference of leisure to material income, a reduced trade union resistance to overtime work in normal times, and the greater attraction of *regular* (as opposed to casual and uncertain) overtime. The general implication is, again, that a high demand for labour will induce an increased supply, of hours as of bodies. And conversely, of course, that a fall in labour demand leads to a reduced supply of working hours.

About the response to labour demand of labour's supply in other dimensions—those of intensity and quality—we know little. Two widely accepted propositions are : (*a*) that both quality and effort decline with rising employment, because of the engagement of inferior workers and the slipping of industrial discipline ; and (*b*) that intensity varies inversely with working hours. There is no evidence for either of these propositions in the trend of output per employee-hour, which seems to have risen more in phases of rising employment (and hence of labour "dilution" and increasing average hours). There will, of course, be a general tendency for the *quality* of labour to rise with rising real wages—an effect partly of the latters' association with the general level of education. But as regards its intensity, there are certainly suggestions that this is liable to "Employment Effects" similar to those shaping the supply of people and

labour time. For instance, there are social and institutional restraints on the intensity of work ("make-work" rules, and so on) which are relaxed by securely rising employment, and tightened-up in recession. "Employment Effect Two" again.

The Bargaining Strength of Labour

Various incidental points apart, a principal conclusion of this paper is that, given a general level of employment which has been and remains, in relation to inter-war experience, relatively high, fluctuations in the demand for labour are reflected in changes, not so much in the number of "unemployed" as that term has been usually understood, but in two other categories. First, in the number of secondary workers actually in the labour market. Second, in the working hours (and probably, effort) of workers at large. So that the main effect of, say, a moderate contraction in the demand for labour is less to induce a labour surplus than to provoke a reduction in the supply of labour itself.

This is partly a side-effect of a generation of relative labour scarcity, and partly a consequence of the connected strengthening of collective organisation among the primary workers—which has improved their defences against redundancy. At any rate, for them, the major implication of a fall in the demand for labour is a cut in hours, and particularly a surrender of overtime. And this is mainly temporary, lasting only so long as it takes for the available labour force to reduce itself by the naturally high rate of wastage and retirement among the secondary workers already employed.

It is obvious that a contraction in labour demand of this sort will have a much smaller impact on the bargaining strength (and resolution) of the well-organised primary workers, than would a similar contraction from a *lower* general level of employment, which would create a pool of "open" unemployed among the primary workers themselves. Indeed, insofar as loss of overtime or of wives' employment reduces family earnings, it may actually build up pressures for increased basic wage-rates, or for other compensations (like redundancy payments or earnings guarantees) which have a similar effect on labour costs.

Before the bargaining power of the labour force's overwhelming majority of permanent and committed wage-earners is reduced to the point at which wage-advances are held back (to, say, the normal rate of productivity increase) by restriction of demand alone, that restriction must be large enough to create substantial and obvious unemployment among the primary workers themselves. So that to induce (say, again) a slowing in the rate of wage advance by 1 per cent. per annum, the cut in final demand would have to be very much bigger than would be required under pre-war circumstances.

We have seen that, between November, 1955 and November, 1958, employment of operatives in manufacturing industry fell by considerably more than published figures of general employment and unemployment would suggest. The annual increase in their hourly wage-rates over these three years of falling employment, 1956—58 inclusive, averaged 5·5 per cent.—compared with an annual average increase of 6·2 per cent. over the whole preceding post-war decade, 1946—55. Even in the last year here dealt with, 1958, when the recession in employment sharpened—total operative-hours in manufacturing falling (see Table I) by nearly 5 per cent.—the advance of average hourly wage-rates was still 3·5 per cent. And it has been noted that this index is not a full measure of labour-cost advances. Despite reduced overtime payment (and no doubt piece-workers' bonuses) the Ministry of Labour reported that weekly earnings continued to rise as fast as nominal weekly wage-rates over 1956-58.[1] While it seems even likely that salaried workers—who have been shown to be unaffected by the decline in demand for labour—took advantage of the slowing in manual workers' wage-movements to make up some of the relative lag from which their pay had formerly suffered. Over these years, for instance, the pay of

[1] *Ministry of Labour Gazette*, Feb., 1959. It is not possible to judge the recession's effect on—what is more relevant—the relation between *hourly* earnings and rates, since a monthly index of hourly wage-rates has only been published for 1958 itself.

clerks rose more than manual workers, instead of (as formerly) less.[1]

But if the supply of labour has several dimensions, so has labour's bargaining strength. By the end of 1958—when the official percentage of unemployment was still only 2·4—it had become apparent that the fall in employment required to induce this slowing of wage-advances was politically intolerable. And although it had not yet brought the pace of wage-increases down to the *normal* rate of productivity growth, it had involved a substantial interruption of productivity growth itself. So that, in face of contracted final markets and limited possibilities of price-increases, the concern of businessmen reinforced the wage-earners' resentment of significant labour redundancies. The recession had a moderate effect on wage-increases ; but it led to an absolute fall in company profits.

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[1]The Office Management Association's biennial survey of clerical salaries showed (according to *The Economist*, 21st Feb., 1959, p. 678) no slackening in the rise of "experienced clerks'" pay over 1956-58 when compared with previous surveys, and an actual acceleration in pay-advances for "senior clerks."

Life Assurance Funds and the Capital Market

The accumulated life and annuity funds of the assurance companies established in Great Britain amounted to £3,618 million in 1956 and are now growing at a rate of over £240 million a year. With a fund of this magnitude, it is little wonder that the influence of the life offices in some sectors of the capital market is often considered to be dominant, while for the classes of security of which this is not thought to be already true, the rate of increase of life funds would seem to suggest a rapidly growing significance.

In order to determine whether such presumptions as these have any basis in fact, the total market values of the main categories of life-office assets have been compared for three separate periods in the accompanying table, with the relevant holdings of 38 companies which consistently transact well over 80 per cent. of total life business. (The figures presented have been taken from company balance sheets and concern the disposition of life funds only.) The underlying weakness involved in these comparisons is of course, that the balance-sheet values used do not reflect true market values, being based usually upon cost of acquisition less reserves : balance-sheet values are usually well inside market values in order to enable companies to write down the value of assets, as may become necessary from time to time due to adverse price movements, or else to strengthen investment reserves, or to carry such balances forward. Because these companies write down, and seldom write up the value of their investment portfolios, the comparisons made in the table are likely to be underestimates of the true proportions between life office holdings and the total market value of any particular category of security. In spite of this however, they should be sufficiently accurate for the orders of magnitude, and the trends yielded by the comparison of three periods (each separated by almost a decade from the other), to provide a reasonable assessment of the importance of the assurance companies in the sectors of the market examined.

The table shows a rise in the proportion which the portfolios of the 38 companies bear to the total market value of British Government and Guaranteed securities from pre-war days to 1947, reflecting the enormous increase in life-office purchases during the war following the "gentleman's agreement" between all such investing bodies and the monetary authorities, to purchase Government bonds with their available funds. The further increase in the ratio of life-office portfolios to total market value from 4·9 per cent. to 5·3 per cent. between 1947 and 1956 provides some indication of the value of the nationalisation stocks which these companies now hold, since the growth of their holdings has been greater than the growth in the total market value of these securities. (The proportion of life fund assets held in this form by the life offices has been reduced from a peak of almost 45 per cent. in 1945 to 25·4 per cent. for 1956).

The examination of the proportion which the 38 life-offices' figures for Loans on the Rates, Municipal and County securities bear to the total market value of U.K. Corporation and County stocks evidently tends to overstate the importance of the assurance companies' contribution of funds to this sector of the market, so that interest must centre mainly on the course of the fluctuations. The table shows that by 1956, the share of total market value taken by the life offices had returned to the pre-war level. This occurred moreover, in spite of a continuous decline in the actual value of life-office holdings down to 1955. The explanation for the even greater decline in the total market value of this type of asset was of course, the inability of the local authorities to raise money other than through the Public Works Loan Board during the period of office of the Labour Government, together with the decline in the prices of fixed-interest securities which occurred after the revival of monetary policy at the end of 1951.

In spite of the dwindling importance of Dominion, Provincial, Colonial, and Foreign Government, Provincial and Municipal securities in the assets structure of the life offices (which set in during the early 1930's), the table indicates that life-office portfolios grew somewhat after the war in the teeth of a decline in total market value, and so helped to bring about

some increases in the significance of the assurance companies in this market. The actual increase occurred in these companies' purchases of Dominion, Provincial and Colonial, rather than of Foreign Government, etc. securities, the portfolios of the latter group having declined from £15 million to £9 million during the ten years between 1946 and 1956.

The task of trying to gauge the importance of the assurance companies in the finance of industry and trade before the war is difficult owing to lack of information. In the absence of a breakdown of the figures of total market value, the only pre-war comparison which becomes possible is that between life-office portfolios of all categories of industrial securities, and their total market value, a proportion which turns out to be quite small—of the order of 4 to 5 per cent. Immediately after the war, the share of the assurance companies' holdings in company capital of all kinds appears to have grown somewhat, and by 1956 the proportion had risen to 11 per cent. Closer examination reveals that this life-office stake in company capital is made up of a seemingly spectacular increase in the percentage share of company loan capital held by these institutions ; a substantial rise in the proportion of holdings of preference shares, and finally, a much smaller rise in the proportion of ordinary share portfolios to total market value.

A calculated 5·7 per cent. life office share in the total market value of ordinary stocks squares quite nicely with the proportion of 6 per cent. arrived at by Messrs. Clayton and Osborn,[1] (in a study based on an investigation of the share registers of a number of firms of varying sizes), especially in view of the fact that the failure of these companies to write up equity values except on rare occasions suggests that the proportional significance represented by the figure of 5·7 per cent. is almost certainly an under-estimate. The extent to which this is an under-estimate moreover, is probably greater than the 0·3 per cent. difference which separates the two estimates, since the use of nominees by some of the assurance companies probably makes the Clayton-Osborn figure of 6·0

[1] "Insurance Companies and the Finance of Industry" by G. Clayton and W. T. Osborn. Oxford Economic Papers (N.S.), Vol. 10, Feb., 1958.

per cent. itself an under-estimate. What is certain however, is that the percentage *increase* in the proportion of life-office portfolios of ordinary shares to total market value since 1947 has been considerable, though from the order of magnitude of the proportions involved, this has not yet resulted in the emergence of these companies to what may be described as a dominant position in the market.

The table shows that the life-office holdings of preference shares form a much larger proportion of the total market value of this stock than is true of the share of equities held by these companies : the proportion has moreover, grown rapidly since 1947 as a result of a fall in the total market value of preference shares to half its 1947 size. The resulting life-office share of about 22 per cent. of the total market value of preference shares (derived from a total market value of £1,024 million and a balance-sheet figure of £228 million for 1956), represents a considerable departure from the Clayton-Osborn proportion of a share of 13 per cent.[1] The present figures however, leave little doubt that the decline in the popularity of preference shares in the post-war period has not been reflected in the attitude of the assurance companies : provided that the yield is good, preference shares are attractive to institutional investors, being free of the unwanted responsibilities of control.

A similar trend is apparent from the table in the field of loan capital, for which the life offices have had an even more voracious appetite over the past decade, though this has done no more than to re-establish its relative importance in the assets structure of these companies to the 15 per cent. or so characteristic of the 1930's. From 1947 to 1956, the total market value of this type of security fell by almost a half, having been affected in common with other fixed interest securities by dearer money since the end of 1951. This fall in the total market value of loan stock, in conjunction with a life office portfolio which has doubled in value over this period, has given rise to an enormous increase in the importance of these

[1]Even when account is taken of the fact that the Clayton-Osborn study is of nominal values for 1953, a considerable discrepancy still remains, because new issues of preference shares during the three succeeding years amounted to no more than £52 million.

institutions in this sector of the market. It must be remembered however, that the portfolios of the life offices contain a considerable selection of privately issued debentures, which, being unquoted, do not go to swell the figure of total market value, but which do contribute to the balance-sheet figures of life-office portfolios of this type of security. Even so, it is evident from such orders of magnitude that these institutions are extremely important lenders of capital to industry, having been heavy buyers of suitable loan stocks since the war.

In addition to those already mentioned, there are, of course, other comparisons which might be undertaken in collecting evidence with which to assess the importance of life-office funds in the capital market. Messrs. Clayton and Osborn for example, have compared figures of new capital issues with the growth of insurance companies' industrial assets, and shown that the ratio of increase in company assets held by these institutions to new industrial issues, has increased appreciably since the war.[1] With the presentation of figures for net fixed capital formation in the blue books on National Income and Expenditure, a further comparison is now afforded between the net fixed capital formation of companies in the economy on the one hand, and changes in the balance-sheet values of industrial securities of the assurance companies on the other. The result of the comparison is that changes in the portfolios of industrial securities held by these institutions amounted to a quarter of the increase in the net fixed capital formation of companies for both 1938 (the only pre-war year for which official figures are available), and the average of the period 1948 to 1956, which suggests that the life offices are at least maintaining the relative contribution which they make both directly and indirectly, to the finance of company fixed capital formation, which is now proceeding at much a higher rate than before the war.[2]

[1]*Op. cit.*, p. 84.

[2]For 1938 the figures are £88 million net fixed capital formation of companies and £22 million for the change in the portfolios of the 38 life offices of debentures, preference, and ordinary shares. For the period 1948 to 1956, the figures are £2,742 million and £674 million respectively.

The proportion of the total market value of assets other than debentures and preference shares held by the assurance companies has been shown by this study to be very modest. Even in the case of ordinary shares, in which the increase in the value of portfolios since 1947 has been greater than for any other category of assets apart from Mortgages and Loans,[1] the proportion of total market value held in the portfolios of these institutions has certainly remained well under 10 per cent.[2] The significance of the assurance companies in all sectors of the capital market, with the exception of Municipal and County Securities, has been shown to have increased since before the war. In two cases where the absolute increase in assurance company holdings has been most striking however, (i.e. in gilt-edged and in equities), total market value has also risen by so much that the share of life-office portfolios in the total has remained small. Thus as far as participation in the risks of business enterprise by the life offices is concerned, the very appreciable rise in the relevant holdings of these institutions may be quoted as evidence of a transformed outlook. On the other hand, a ratio of life office portfolios to total market value of equities of some 6 per cent. still appears too small to those who argue that compared with the rich private investor (whose relative importance has of course declined), these institutions are far too cautious.

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[1]The increases of £336 million and £352 million respectively in these two items, represent, when taken together, very nearly half the total increase in the assets of the 38 life companies between 1947 and 1956.

[2]For 1956 the balance-sheet value of ordinary shares for the 38 companies considered was £518 million, representing 16·7 per cent. of life office assets, as compared with 14·6 per cent. for debentures and 7·3 per cent. for preference shares.

TOTAL MARKET VALUES OF CERTAIN SECURITIES COMPARED WITH THE PORTFOLIOS OF 38 LIFE OFFICES

CLASS OF SECURITY	Column 1 Total Market Value		Column 2 Portfolios of 38 Life Offices		Column 2 as %age of Column 1	
	1937/8/9 Average(1)		1937/8/9 Average			
(i) British Govt. and Guaranteed	6,741		263			3·9%
(ii) Loans on Rates, Municipal and County Securities	516		87(3)			16·8%
(iii) Dominion, Provincial, Colonial and Foreign Govt. etc., Stocks	980		106			10·8%
(iv) Company Loan Capital		9,627		412		4·3%
(v) Company Preference Capital						
(vi) Company Ordinary Capital						
	At 30–6–1947(2)		1947			
(i) British Govt. and Guaranteed	13,861		674			4·9%
(ii) Loans on Rates, Municipal and County Securities	769		78			10·1%
(iii) Dominion, Provincial, Colonial and Foreign Govt. etc., Stocks	894		75			8·4%
(iv) Company Loan Capital	1,138	9,982	202	556	17·8%	5·6%
(v) Company Preference Capital	2,187		172		7·9%	
(vi) Company Ordinary Capital	6,657		182		2·7%	
	At 31–12–1956(2)		1956			
(i) British Govt. and Guaranteed	14,717		786			5·3%
(ii) Loans on Rates, Municipal and County Securities	493		83			16·3%
(iii) Dominion, Provincial, Colonial and Foreign Govt. etc., Stocks	839		121			16·8%
(iv) Company Loan Capital	681	10,773	452	1,198	66·5%	11·0%
(v) Company Preference Capital	1,024		228		21·9%	
(vi) Company Ordinary Capital	9,116		518		5·7%	

(1) Calculated from the Stock Exchange Daily Official List, together with the addition of the Supplementary List for 1939. No separate figures for the various categories of company capital exist for the pre-war years: the aggregate figure given has moreover, been reduced by an estimate for Investment Trust securities, together with those having no sterling quotation etc., in order to reduce it to approximate comparability with the post-war figures.

(2) From INTEREST & DIVIDENDS UPON SECURITIES QUOTED ON THE STOCK EXCHANGE published by the Council of the Stock Exchange.

(3) Average of 1937 and 1938 only.

A Monthly Index of Wage-Rates by Industries

In a previous article [1] Devons and Ogley gave indices of wage-rates for the Orders of the 1948 Standard Industrial Classification, taking 1948 as base, and using as weights the wage-bills of that year.

The calculation of these indices is now being made continuously by Professor Devons and the present author, and it is intended to publish the latest results regularly in this *Journal*. The basis of the indices will shortly be revised, and at the same time they will be converted to the new Standard Industrial Classification.

Annual figures are now given for adult workers, for 1955, 1956, 1957 and 1958, together with a continuous monthly series from January, 1955 to December, 1958. These have been calculated on the same basis as the figures published in Table 4 of the previous article, except that the number of individual wage-relatives averaged has been reduced by the introduction of representative sampling, where an inspection of the previous calculations indicated that this was not likely to reduce the reliability of the indices significantly.

The monthly indices relate to the wage-rates effective during the greater part of the month. If a change in the rates occurs in the first half of the month, the whole of the month is counted at the new rates. Similarly when a change occurs in the second half of the month, the new rates will not appear in the indices until the next month. The official monthly index of wage-rates published by the Ministry of Labour relates to *the end* of the month, and therefore includes the new rates which come into effect at any time during the month. It follows that the present indices are not comparable with the official index, in respect of their timing.

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[1]See "An Index of Wage-rates by Industries," Ely Devons and R. C. Ogley ; *The Manchester School*, May, 1958.

MONTHLY WAGE RATE INDEX BY INDUSTRIES, 195
ADULT WORKERS

AVERAGE 1948 = 100·0

S.I.C. Order		I	II	III	IV	V	VI			VII	VIII	IX	X	
	Total All Industries	Agriculture, Forestry and Fishing	Mining and Quarrying	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	56	79	19	18	39	102	14	74	61	25	7	46	14
JAN.	137·8	133·9	134·2	137·6	140·2	138·7	138·8	139·7	138·8	138·9	141·1	135·3	139·9	137·4
FEB.	139·0	140·7	134·9	138·2	143·7	138·7	138·8	139·7	138·9	138·9	141·1	135·3	140·2	138·1
MAR.	140·4	141·2	135·0	140·3	144·2	141·2	146·8	149·6	146·8	138·9	143·8	135·3	140·5	138·1
APL.	141·8	141·2	145·9	142·8	146·0	141·3	147·4	149·6	146·9	138·9	144·5	135·7	140·7	138·1
MAY	143·1	141·2	146·0	144·4	146·0	148·9	147·6	149·6	147·0	138·9	145·8	137·4	140·9	138·1
JUNE	144·4	141·2	147·0	146·3	146·5	149·5	147·8	149·6	147·3	145·6	146·5	138·5	141·6	138·1
JULY	144·8	141·3	147·1	146·8	146·8	149·5	148·1	149·6	147·4	145·6	147·0	138·5	143·5	138·1
AUG.	145·0	141·4	147·2	147·3	147·6	151·0	148·1	149·6	147·5	145·6	147·0	138·5	143·5	138·1
SEPT.	145·2	141·4	147·2	147·3	147·9	151·0	148·2	149·6	147·6	145·6	147·0	138·5	143·8	138·1
OCT.	145·6	141·4	147·2	147·3	147·9	150·7	148·2	149·6	147·6	145·7	148·9	139·1	144·3	138·1
NOV.	145·9	141·8	147·2	147·3	148·0	151·1	148·2	149·6	147·6	145·7	149·0	139·1	145·0	138·1
DEC.	146·4	141·8	147·2	147·7	148·0	151·5	148·2	149·6	147·7	145·7	150·3	142·6	145·6	138·6
Annual Average 1955	143·3	140·7	143·9	144·5	146·1	147·0	146·3	147·9	145·9	143·1	146·0	137·8	142·6	138·1

XI	XII	XIII	XIV	XV	XVI	XVII		XVIII	XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Gas, Water and Electricity	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
4	27	37	17	24	11	114	78	20	98	80	29	12	75
137·3	136·2	140·9	143·5	144·4	134·5	139·7	139·2	143·4	137·0	140·5	137·3	132·9	130·0
137·3	136·5	140·9	144·1	144·9	138·8	141·4	140·7	143·4	137·4	142·6	137·3	132·9	131·7
137·3	136·5	141·6	144·1	144·9	138·8	141·7	140·7	143·5	138·4	142·7	138·2	132·9	133·5
137·3	137·8	141·7	146·1	145·0	138·9	141·7	140·7	150·4	138·4	143·6	139·1	132·9	134·5
137·3	137·8	143·5	148·0	145·0	139·5	148·0	147·8	150·4	139·2	143·6	139·8	132·9	134·5
139·0	137·8	144·5	149·0	145·0	139·9	148·2	147·8	150·4	140·9	143·6	144·0	142·5	136·9
139·0	137·8	145·0	149·0	148·7	141·2	148·3	147·9	150·4	141·6	143·6	144·0	142·5	136·9
144·8	137·8	145·4	149·1	148·7	142·5	148·3	147·9	150·4	141·7	144·1	145·7	142·5	136·9
144·8	141·7	146·5	149·1	148·7	142·5	148·3	147·9	150·4	141·7	144·2	145·7	142·5	136·9
144·8	142·3	146·7	153·4	149·4	142·5	148·3	147·9	150·4	141·9	146·7	145·7	142·5	136·9
144·8	142·6	146·7	153·5	149·4	142·5	148·3	147·9	150·4	143·5	147·0	145·7	142·5	137·1
145·2	142·7	147·6	153·6	149·6	149·2	148·6	147·9	150·4	146·6	148·8	145·7	142·5	137·2
140·7	138·9	144·2	148·6	146·9	140·9	145·8	145·3	148·7	140·7	144·3	142·3	138·5	135·3

MONTHLY WAGE RATE INDEX BY INDUSTRIES, 1956 ADULT WORKERS

AVERAGE 1948 =100·0

S.I.C. Order		I	II	III	IV	V	VI			VII	VIII	IX		X
	Total All Industries	Agriculture, Forestry and Fishing	Mining and Quarrying	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	56	79	19	18	39	102	14	74	61	25	7	46	14
JAN.	147·2	141·8	147·3	147·7	148·1	152·4	148·3	149·6	147·7	145·7	151·6	146·1	146·0	138·6
FEB.	149·9	148·6	159·4	148·8	153·0	152·4	148·8	149·6	148·1	153·9	152·6	147·4	146·5	138·6
MAR.	152·4	150·6	158·7	150·0	154·4	154·6	158·8	161·1	158·4	154·7	153·2	147·4	146·5	138·6
APR.	153·7	150·6	158·9	153·0	155·3	162·0	159·0	161·1	158·5	156·1	155·0	148·4	147·1	138·6
MAY	155·3	150·6	159·1	155·8	155·6	162·5	159·1	161·1	158·5	156·1	156·1	151·9	149·7	144·9
JUNE	155·7	150·6	159·1	155·8	156·1	164·1	159·1	161·1	158·6	156·1	156·6	151·9	149·8	144·9
JULY	156·4	150·6	159·1	155·8	156·2	163·6	159·1	161·1	158·6	156·1	158·9	152·6	153·2	144·9
AUG.	156·6	150·6	159·1	156·2	156·9	163·6	159·4	161·1	159·0	156·1	158·9	152·6	153·1	144·9
SEPT.	157·1	156·2	159·1	156·2	157·1	163·1	159·4	161·1	159·0	156·1	159·3	152·6	153·2	145·0
OCT.	157·2	156·2	159·1	156·2	157·6	163·6	159·5	161·1	159·0	156·1	159·3	152·5	153·3	145·1
NOV.	157·4	156·2	159·1	156·2	158·0	163·6	159·5	161·1	159·2	156·1	160·2	152·5	153·8	145·1
DEC.	157·5	156·2	159·1	156·2	158·0	164·1	159·5	161·1	159·2	156·1	160·2	152·5	152·9	145·1
Annual Average 1956	154·7	151·6	157·9	154·0	155·5	160·8	157·5	159·2	157·0	154·9	156·8	150·7	150·4	142·9

XI	XII	XIII	XIV	XV	XVI	XVII		XVIII	XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Gas, Water and Electricity	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
4	27	37	17	24	11	114	78	20	98	80	29	12	75
45·2	145·6	148·8	155·1	155·8	149·5	148·6	147·9	156·2	144·6	148·8	151·9	142·5	138·8
45·2	145·8	148·8	155·8	155·8	149·5	151·6	151·1	163·5	145·0	149·3	152·6	142·5	138·9
45·2	146·2	150·5	157·1	155·8	150·8	152·2	151·1	163·7	148·3	151·8	157·0	152·9	142·4
45·2	148·6	153·8	159·1	156·3	151·4	152·6	151·1	163·7	150·2	153·6	160·0	152·9	142·5
47·7	148·9	156·8	162·4	163·5	151·3	159·6	159·1	163·7	151·7	154·1	160·0	152·9	143·0
47·7	149·3	157·1	163·6	163·5	151·3	159·6	159·1	163·7	151·7	154·1	160·0	152·9	145·7
52·3	151·0	157·2	166·0	166·7	151·3	159·6	159·1	163·7	153·1	156·4	160·0	153·3	146·7
54·3	151·0	157·2	166·0	167·9	153·9	159·6	159·1	163·7	153·1	156·6	160·0	153·3	146·7
54·3	157·2	157·2	166·0	168·0	153·9	159·6	159·1	163·7	153·1	157·0	160·0	153·3	146·7
54·3	157·3	157·2	165·2	168·6	153·9	159·6	159·2	163·7	153·3	157·3	160·6	153·3	146·7
54·6	158·4	157·6	165·2	168·6	153·9	159·6	159·2	163·7	154·5	157·3	161·1	153·3	146·7
54·6	158·4	157·6	165·2	168·8	153·9	159·6	159·2	163·7	154·5	158·1	161·1	153·3	146·8
50·1	151·5	155·0	162·2	163·3	152·1	156·8	156·2	163·1	151·1	154·5	158·7	151·4	144·3

MONTHLY WAGE RATE INDEX BY INDUSTRIES, 1957
ADULT WORKERS

AVERAGE 1948 = 100·0

S.I.C. Order		I	II	III	IV	V	VI			VII	VIII	IX	X	
	Total All Industries	Agriculture, Forestry and Fishing	Mining and Quarrying	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	56	79	19	18	39	102	14	74	61	25	7	46	14
JAN.	157·7	156·2	159·2	156·2	158·0	164·1	159·6	161·1	159·2	157·7	160·3	152·9	153·1	145·1
FEB.	158·2	156·2	159·2	156·9	158·5	164·5	159·7	161·1	159·4	157·8	160·8	152·9	153·5	145·1
MAR.	159·5	157·0	167·6	156·9	159·2	165·3	159·8	161·1	159·5	157·8	161·6	152·9	154·0	145·4
APR.	159·9	157·4	167·7	159·9	165·0	165·3	159·8	161·1	159·6	157·8	161·6	152·9	154·6	145·6
MAY	161·1	157·4	167·7	162·3	165·5	165·3	161·1	161·1	160·0	162·1	161·6	157·8	155·2	145·6
JUNE	163·3	157·4	167·8	162·6	165·9	167·4	168·9	171·0	168·4	162·1	165·6	158·8	155·6	145·6
JULY	163·8	157·4	167·8	162·6	166·2	167·5	168·9	171·0	168·5	162·1	165·6	159·7	155·9	145·6
AUG.	164·4	157·4	167·9	162·6	166·2	168·4	169·0	171·0	168·6	163·4	166·6	161·1	158·3	152·4
SEPT.	164·9	157·4	167·9	162·6	166·5	174·7	169·4	171·0	169·1	163·4	166·8	161·5	158·7	152·4
OCT.	165·2	157·4	167·9	162·6	166·7	174·0	169·5	171·0	169·3	163·4	169·0	162·2	158·8	152·4
NOV.	165·9	166·3	168·0	162·6	166·7	174·0	169·6	171·0	169·3	164·0	169·4	162·2	159·1	152·4
DEC.	166·2	167·3	168·0	163·6	166·7	174·7	169·6	171·0	169·3	164·0	170·3	163·2	159·4	152·4
Annual Average 1957	162·5	158·7	166·4	160·9	164·3	168·8	165·4	166·9	165·0	161·3	164·9	158·2	156·3	148·3

XI	XII	XIII	XIV	XV	XVI	XVII		XVIII	XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Gas, Water and Electricity	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
4	27	37	17	24	11	114	78	20	98	80	29	12	75
154·6	158·7	158·4	166·1	167·0	153·9	159·6	159·2	163·7	154·5	158·1	161·9	153·3	146·8
154·6	161·1	158·4	166·2	170·1	153·9	162·6	162·5	163·7	154·5	158·1	163·1	153·3	146·8
154·6	161·7	158·8	166·2	170·1	153·9	162·6	162·5	167·3	156·9	158·6	163·1	153·3	147·7
154·6	161·7	158·9	167·0	170·2	154·1	162·7	162·5	169·3	157·2	159·5	163·1	153·3	147·7
154·6	162·1	162·9	169·0	170·2	154·6	163·0	162·5	172·8	157·8	160·5	166·5	161·3	148·7
154·6	162·1	164·4	170·3	170·4	159·8	167·8	167·4	172·8	159·2	164·4	168·3	161·3	148·8
163·3	162·6	164·9	171·0	173·6	160·7	167·9	167·4	172·9	159·8	164·5	169·2	161·3	150·8
163·3	163·8	165·0	171·0	173·6	160·7	167·9	167·4	173·0	162·6	164·5	169·2	161·3	152·0
167·8	163·8	166·3	173·6	173·6	161·1	167·9	167·4	173·0	162·6	164·7	169·2	161·3	152·0
167·8	163·9	166·6	176·0	173·6	161·1	167·9	167·4	173·0	162·8	165·4	169·2	161·3	153·1
167·8	163·9	166·9	176·0	173·6	161·1	167·9	167·4	173·0	162·8	165·4	169·2	161·3	155·7
169·6	163·9	166·9	176·2	174·7	161·1	167·9	167·4	173·0	162·8	166·7	169·2	161·3	155·7
160·6	162·4	163·2	170·7	171·7	158·0	165·5	164·7	170·6	159·5	162·5	166·8	158·6	150·5

MONTHLY WAGE RATE INDEX BY INDUSTRIES, 1958
ADULT WORKERS

AVERAGE 1948 = 100·0

S.I.C. Order		I	II	III	IV	V	VI			VII	VIII	IX	X	
	Total All Industries	Agriculture, Forestry and Fishing	Mining and Quarrying	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	56	79	19	18	39	102	14	74	61	25	7	46	14
JAN.	166·4	167·3	168·1	163·6	167·0	175·3	169·6	171·0	169·3	164·0	170·5	163·2	160·0	152·4
FEB.	166·9	167·3	168·1	164·4	167·0	175·6	169·7	171·0	169·5	164·0	170·5	163·2	160·0	152·4
MAR.	166·9	167·3	168·1	164·4	167·0	175·6	169·7	171·0	169·5	164·0	170·5	163·2	160·0	152·4
APR.	167·0	167·3	168·1	165·3	167·7	175·3	169·7	171·0	169·5	164·0	170·5	163·2	160·0	152·4
MAY	167·2	167·3	168·1	165·3	167·7	175·6	169·7	171·0	169·5	164·0	170·5	163·2	160·9	152·4
JUNE	167·6	167·3	168·2	166·0	167·7	176·6	169·8	171·0	169·6	164·0	171·6	163·2	161·3	152·4
JULY	168·6	167·3	168·2	166·2	167·7	176·6	169·8	171·0	169·6	164·9	171·6	163·5	161·3	152·4
AUG.	169·2	167·3	168·2	167·5	167·9	177·0	169·8	171·0	169·7	164·9	172·4	163·5	161·6	152·4
SEPT.	169·4	167·3	168·2	167·9	171·4	175·7	169·9	171·0	169·7	164·9	172·5	163·5	161·5	152·6
OCT.	171·1	167·3	174·5	169·0	173·4	177·0	175·9	178·4	175·4	168·8	174·4	163·3	161·4	152·6
NOV. (1)	171·7	172·6	174·6	169·2	173·7	177·0	176·0	178·4	175·5	168·8	174·8	163·3	162·4	152·6
DEC. (1)	172·0	173·9	174·6	169·6	173·8	178·0	176·2	178·4	175·7	169·6	174·8	166·8	162·6	152·8
Annual Average 1958 (1)	168·7	168·3	169·7	166·5	169·3	176·3	171·3	172·8	171·0	165·5	172·0	163·6	161·1	152·5

(1) Liable to revision

XI	XII	XIII	XIV	XV	XVI	XVII	XVIII		XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Gas, Water and Electricity	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
4	27	37	17	24	11	114	78	20	98	80	29	12	75
169·9	163·9	167·8	176·3	177·3	162·5	167·9	167·4	173·4	162·8	166·7	169·2	161·3	155·7
169·9	166·0	168·3	176·3	177·5	162·5	170·9	170·7	173·4	162·8	166·7	169·2	161·3	155·7
169·9	166·0	168·3	176·3	177·6	162·5	170·9	170·7	173·4	162·8	167·3	169·2	161·3	155·7
169·9	168·8	168·6	176·3	177·6	162·5	170·9	170·7	173·4	162·8	167·5	169·2	161·3	155·7
169·9	169·8	168·8	176·9	177·6	162·9	170·9	170·7	176·6	162·8	167·5	169·2	161·3	155·7
169·9	169·8	169·6	178·3	177·9	162·9	170·9	170·7	176·6	162·8	169·2	169·2	161·3	156·6
169·9	171·2	171·7	178·2	179·8	164·2	174·0	173·7	176·6	165·0	171·5	169·6	161·3	156·6
169·9	171·6	171·7	180·4	179·8	164·2	174·1	173·7	181·3	165·3	172·7	174·5	168·1	156·9
169·9	171·7	172·4	180·5	179·7	164·7	174·1	173·7	181·3	165·8	173·0	174·5	168·1	156·9
169·9	171·7	173·8	180·1	181·0	169·1	174·3	173·8	182·8	165·8	173·2	174·5	168·1	158·0
175·1	171·7	173·8	180·3	181·0	169·1	174·4	173·8	182·9	167·4	173·2	174·5	168·1	158·0
175·1	171·8	173·9	180·4	181·0	169·1	174·4	173·8	182·9	167·6	173·2	174·5	168·1	159·1
170·8	169·5	170·7	178·4	179·0	164·7	172·3	172·0	177·9	164·5	170·1	171·4	164·1	156·7

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Probability and Economic Decision Taking*

Introduction

Since the war a great deal of theoretical literature has appeared on decision taking under uncertainty. A small amount of literature had appeared before the war. Frank Knight([1]) had written on the general problem of uncertainty in economics in 1921 and Professor Shackle([2]) first proposed the ideas which he developed later in an article in 1939. Ramsey([1]) in 1926 also proposed ideas which were later to be widely developed in the discussion on decision taking under uncertainty, whether applied to economics or not. However, it is since the war that the bulk of the work in this field has been done. The literature is vast, extending over philosophy, psychology and mathematics, as well as economics, and much of it is expressed in mathematical language which puts it beyond the comprehension of many economists. The present article is an attempt to discuss the various problems encountered in this field and review some of the prominent lines of thought expressed in the literature.

The Problem

The general problem of decision taking under uncertainty is that of how to choose between several possible acts (one of which may be to do nothing) when the consequences of the acts are not known with complete certainty. Various problems arise immediately, even before a theoretical model can be started. Initially, the purpose of the theory could be to make a model† which will describe either actual decision taking or rational decision taking. The problems raised in models of actual decision taking are different from those raised in models of

*I am indebted to Professor Harry Johnson, Mr. A. D. Roy, Mr. W. Peters and Mr. Christopher Foster for helpful comments. Their complete agreement with the points of view expressed in the paper must not be assumed.

†A model of choice does not of course need to use concepts which the actual choosers formulate explicitly. A model of choice under uncertainty can use concepts such as probability in the same way as models of choice under certainty use indifference curves, without its affecting the issue that few consumers have ever heard of them.

rational decision taking. In the case of the former, the problem of the testing of hypotheses is imposing. In the case of the latter then the whole problem of rationality must be explored and defined. Sometimes, a model of rational decision taking is regarded as an approximation to actual decision taking. A definition of what is meant by rationality is not at all easy to make as the word has been used in many different senses and too often is implicitly used to mean what the particular writer would do himself. (See Shoeffler(1) for a discussion of rationality). A possible definition of rationality would be the pursuance of stated ends by the most economical means. The problem of deciding whether an act in fact is rational or not requires a knowledge of the ends of the particular individual in question. Thus a business man who likes leisure will not pursue maximum profits in an objective money sense because after a point he will prefer taking his ease to getting more money. In not aiming for maximum profits he is not being irrational, but only acting to maximise his over-all satisfaction. Thus, unless one can discover a business man's preferences, so that a judgment can be passed on the efficiency with which he pursues them, no judgments of rationality can be made. The emphasis on rationality is very different in different writers ranging from Shackle, who is very firm about discussing actual conduct, to Marshak, who is more ready to discuss rational business conduct, and further to the work of some statisticians (e.g. Wald(1) and Savage(1) (who are explicitly making recommendations for optimum conduct in given situations.

Another question which has to be considered as a preliminary, is, what sort of economic decision the theory is concerned with. A decision is regarded as the choice of one course of action where others are genuine alternatives. Decisions are constantly being made in firms at all sorts of levels, from whether to clean the office windows once or twice a month, to whether to build a new plant or not. It is the second type of decision which is obviously of greater importance and also which poses the most serious problems, and it is this which has been the subject of the discussion. The problems raised are basically how such a decision will be made when the amount of previous experience on which to estimate what is likely to

happen is limited, and also how it will be taken when a great deal hangs on the result of the decision, a "crucial decision" in Professor Shackle's terminology. There is an intermediate type of decision, such as a decision on what levels of stocks to hold. This sort of problem has been dealt with by rather different methods and will not be the subject of this article, which will be confined to a discussion of crucial decisions, decisions such as large scale investment decisions.

There is a final point to settle. How general should a theory of decision be? Perhaps as a result of the inter-disciplinary approach to the subject, decision theory has tended to discuss rather widely, to include petty gambling and economic decisions and any other decisions taken under uncertainty. The use of gambling situations to illustrate problems is often invaluable, but it is not necessarily the case that the same considerations will apply in gambling and investment decisions. Arrow holds that a theory of decision taking should be general, and while this might be an ultimate aim it seems a little premature to attempt to make a general theory of decision at this early stage. Investment decisions are taken less frequently than gambling decisions; more, usually, hangs on them; they are frequently taken by boards of directors rather than single individuals; and there is often a question of how much knowledge it will pay a business man to obtain, when knowledge reduces uncertainty but also involves a cost of acquisition. All these problems raise issues which are of great importance in business situations, but are of much less importance in gambling situations.

Probability and Degree of Belief

The problems of uncertainty have traditionally been handled in terms of probability. The analysis of the possible meanings of probability has been carried out by philosophers, and it has become clear that there are at least two concepts of probability. We must consider these concepts of probability to see if they have any usefulness in the analysis of business decisions.

Consider the tossing of a die. The probability of any result, say a five, can be conceived of in two ways. (See e.g.

Carnap, Russell, Braithwaite). After a large number of throws it can be observed that the approximately 1/6 of them are fives. This proportion can be regarded as the probability of a five. Alternatively, an examination of the die reveals that there are six possible ways for it to fall and that there is no reason for assuming that it will fall on one side rather than another. Hence, on this argument by examination, the probability is assessed at 1/6, as there are six equally possible alternatives. In a sense the second form of probability can be regarded as a prediction of the first : they are *ex ante* and *ex post* probabilities. The *ex ante* nature of the second probability should not be pressed too far, though. It can have meaning even if there is no question of there being a series of throws ; that is, it can refer to a single act and be interpreted as a degree of reasonable belief.* The first form of probability is an empirical statement about a series of acts, but this too can be used in relation to a single act as a degree of belief.

The apparatus of probability theory is very incomplete, however, as a theory from which to develop a theory of decision taking, particularly where the theory is meant to be not normative but a theory of how people actually take decisions. There are two important questions which must be raised. Firstly, how, except in simple cases, are the probability numbers to be determined when probability is to be used as a degree of reasonable belief ? Secondly, how, in situations when only one act is to be undertaken, does an individual react to a given probability ? Even though it is agreed that a degree of reasonable belief in the occurrence of a head in the tossing of a coin is 1/2, is it necessarily the case that an individual will be indifferent between refraining from gambling on such a toss and retaining £1, and gambling that a head will turn up and receiving £2 if it does ? (This neglects, for simplicity, the possibility that the marginal utility of money in this range might be decreasing, and that for this reason the bet would not be a fair bet for the individual in any case.)

The two questions are distinct as Professor Shackle has emphasised and will be dealt with separately below.

*Not according to Shackle : see below.

In simple cases such as the tossing of a die, the probability of a fall of any particular number uppermost, say a five, is determined after an inspection of the die. The figure of 1/6 for this probability is reached by observing that the die is symmetrical and that there is no reason for assuming that it is more likely to fall on one side than on any other. In consequence, all possibilities are considered equally likely and are given equal probability numbers. Probability, as derived in this way, by a consideration of the symmetry of the act, is an objective probability in the sense that there would be general agreement about the result. An objective fact of any sort can be regarded as that which is determined by an agreed set of criteria.

The probabilities of the outcomes of an event are dependent on the degree of information available to the observer. Thus two different individuals may apply objective methods of ascribing probability numbers to an act and its set of possible events, and arrive at different answers because their information about the different events was different. For example, if two people are asked to give the probability of the selection of the five of hearts from a collection of playing cards, then person 1 who has been told only that they are normal playing cards (without jokers) will give the probability of this at 1/52. Person II who has been told that these cards are a selection from the pack of the ace to the ten of hearts will estimate this probability at 1/10. Both of the people will have applied objective methods to the evaluation of the probability, but, owing to the dependence of objective probability on the degree of information they will give different results. This, however, does not make the concept of objective probability subjective. The criterion of objectivity is in the tests applied, i.e., that they are generally agreed so that *in the same circumstances* they will arrive at the same result. This sort of agreed test, however, is applicable only in a few types of decision problem, such as gambling with cards or dice, where there are symmetries. In the sort of decision problem which interests an economist, the objective probability of a particular result cannot be determined in this agreed manner.

Does this mean then that the method of allocating a probability number to a degree of belief in an act is not relevant in this important class of decision situations? On the one hand there are writers, such as L. J. Savage (Savage [1]), who urge that a concept of subjective probability can be formulated which obeys the same rules as objective probability in manipulation. Professor Shackle, on the other hand, puts an opposing point of view (Shackle [2] and [3]). The views of this first school of thought will be discussed initially. The concept of subjective probability differs from objective probability in that the person in question cannot formulate his particular degree of belief according to objective criteria. If for instance the question under consideration is whether the demand for motor cars will increase by more than 5% in the coming year—a question which might be relevant in deciding whether or not to make a particular investment—the criteria for estimating the probability of this are not cut and dried as in the case of estimating the probability of a coin falling heads. Thus, if someone argued that the probability of a coin falling heads is 1/4 then it can be replied that either he is applying eccentric criteria in order to calculate the probabilities or he has applied the normal criteria incorrectly. These are not objections which would be made to anyone's estimate of the future demand for motor cars for the objective criteria are insufficient to give a unique answer. Two people estimating the demand for motor cars for the coming year can arrive at different estimates of their degree of belief which cannot be reconciled by logical or factual argument. Though there is no generally agreed method of arriving at a probability number in circumstances such as the ones we have discussed, this does not necessarily mean that a probability number cannot be used as a measure of an individual's degree of belief, providing that it is recognised that the probability number will differ for different people when faced with the same situation.

The principal rules which apply to probabilities are the rules for their addition and multiplication. The problem is whether subjective probabilities obey the same rules for these operations.

If there are two exclusive events A and B then the probability of either A or B occurring is the probability of A plus the probability of B. Thus, if A is the proposition "The demand for motor cars will increase by more than 5% in the coming year" and it is held with subjective probability of ·3 and the proposition B is "The demand for motor cars will increase by between 4% and 5% in the coming year," a proposition which is held with a subjective probability of ·2 then the probability of either the one statement or the other being true—that is the probability that the demand for motor cars will increase by more than 4%—should be held by the person holding the two individual propositions with a subjective probability of ·5, that, is the sum of the two individual probabilities. The second important rule is that if (*i*) an event B does not occur unless event A happens, but is likely to occur with a probability p if event A does happen, and (*ii*) the probability of A happening is q, then the probability of B happening is pq. Thus, let proposition B be "If and only if consumer expenditure in the U.S.A. increases by more than 3% in the next year, then the demand for British motor cars there will increase by more than 5%," which is a statement which is held with a subjective probability of ·8, and proposition A is that "Consumer expenditure in the United States will increase by more than 3%," a proposition held with a subjective probability of ·75, then the subjective probability of the proposition "The demand for British motor cars in the United States in the coming year will increase by more than 5%" should be held with a subjective probability of ·6. These two rules for the relationship of joint probabilities are the two rules which must hold if a theory of subjective probability is to be developed on a strict parallel with the theory of objective probability. They are frequently referred to as the "Boolean postulates" as they can be represented in terms of basic operations of what is known as the Boolean algebra.

This form of subjective probability theory is developed formally by Savage (1) alone, and is used in one form or another by other writers, for example, Marshak (1) and Friedman and Savage (1).

It is at this point that Professor Shackle takes issue with the probability theorists. He rejects the Boolean postulates and introduces a concept of his own called "Potential Surprise" which is not subject to these manipulations. "Potential Surprise" is the degree of surprise which an individual would feel if a particular outcome turned up. The maximum degree of belief is zero potential surprise. That is, for some outcomes an individual would feel no surprise at all if they came about. Zero potential differs radically from unit probability in that an outcome with zero potential surprise can be uncertain, (and usually is, in the type of problem considered) whereas unit probability is defined as the measure of certainty.

It is also the case that several exclusive outcomes in the same situation can carry zero potential surprise and again it is considered by Shackle to be the normal case that they do so. Apart from this the big difference between potential surprise and probability is the extreme form of the rejection of the Boolean postulates. If there are two exclusive propositions A and B where A has the lower degree of potential surprise, that is, it is regarded by the decision taker as being the more likely of the two, then the potential surprise of prediction that either A or B will occur being true is the potential surprise of the element carrying the lowest degree of potential surprise, A. Thus it is held that the decision taker does not add degrees of likelihood, i.e., potential surprise, which is in direct opposition to the normal probability calculus where direct addition is postulated. Shackle is led to this position by a process of intuition. He is concerned with large decisions, where the result of the decision may be either success or failure. In this sort of a position it is plausible to think that a person might think only in terms of what "might happen" and not be over sensitive to degrees of likelihood. Thus, if a person thinks that something or other "might be" the result of an act, then evidence which tends to make this result seem even more likely still only leaves it in the state that it "might happen." There is certainly some intuitive plausibility about this form of reasoning. However, two warnings should be made. Firstly, the type of model which Shackle formulates using his concepts leads to some awkward problems which are left indeterminate,

and secondly, intuition is a notoriously bad guide even to one's own actions, and a worse to those of other people. Shackle emphasises throughout that he is concerned with describing the decision making process and not in prescribing rational conduct.

Many writers have found the strict interpretation of the postulates of probability theory difficult to swallow as descriptions of a person's actual method of combining degrees of belief. However, Shackle's extreme rejection of them leads to some conclusions which are also difficult to accept intuitively, as well as limiting the model which he uses in some important respects. The serious limitation which the Shackle scheme implies is that there is no criterion of choice between two items, both of which have zero potential surprise, but one of which is nevertheless thought of as more likely to occur than another. This has been pointed out among others by Professor Carter. To take an example from gambling to make the issue as clear as possible ; a person will not be surprised if, when a die is tossed, the result is an ace. Thus the occurrence of an ace is given under the Shackle Hypothesis a degree of potential surprise of zero. Similarly the occurrence of a two will have a potential surprise of equal to zero. By the rule described above the potential surprise of the truth of the proposition "Either an ace or a two will occur" is also zero—that is, the same as either of the constituents taken individually. Similarly it is the case that the truth of the proposition "Either an ace, two, three, four or five will occur" has a potential surprise of zero. A situation can be imagined where a choice between two gambles is offered to an individual where each gamble has a stake of £1 and a prize of £3. The first gamble is on whether an ace alone turns up whilst the second gamble is on whether any number save the six turns up. There is no criterion of choice between these two gambles on the Shackle system, for the utilities of both are the same and the measure of uncertainty is the same. This appears a serious limitation on the Shackle formulation of the problem. If this were a situation just confined to gambling it might not be too serious for Shackle's system is meant to deal with large economic decisions. ("Crucial decisions" in his terminology) and it would not be unreasonable

to want a separate theory of gambling behaviour. However, such situations are likely in economic life too. To modify a previous example ; the potential surprise attributed to the hypothesis "The demand for motor cars will go up by more than 5% in the next year" may have for an individual a potential surprise of zero as may the hypothesis "the demand for motor cars will go up by between 0 and 5% during the next year." Consequently, the composite hypothesis "The demand for motor cars will go up next year" will also carry zero potential surprise. There is an obvious sense in which the first of these propositions is less likely than the last composite proposition, and this is also an important sense in the analysis of business decisions. This failure of the Shackle model to distinguish between different degrees of uncertainty in the zero potential surprise range is a serious limitation on its use in some of the situations where we particularly wish to apply it.

REACTIONS TO RISK

The second part of the analysis of behaviour under uncertainty is the consideration of how people act, having estimated in some way the degree or belief in particular outcomes of an act. That is, if the question is assumed to be one where the act itself involves an expenditure (the normal situation in both business and gambling situations) and there are various possible outcomes to which are ascribed various degrees of belief, then how does an individual decide whether to undertake the act or not and also how does he select between several different possible acts ? Various answers have been given to these questions, some of which are mutually inconsistent. The approach to this which has had great favour amongst many decision theorists states urges that to maximise the mathematical expectation * of utility is the most appropriate behaviour rule. Caution is necessary in interpreting this rule, owing to the rather special definition of utility in this context which leads to its measurability. A brief outline of the method

*The mathematical expectation of the utility of an act is the sum of the possible utilities each multiplied by their respective probabilities. E.g., if an act has two consequences *A* and *B* with utility values 8 and 12, and probabilities 1/4 and 3/4, then the mathematical expectation is :

$$(8 \times 1/4) + (12 \times 3/4) = 11.$$

of measuring utility can be given.* An individual is offered a choice between two gifts. The value of the first is £10 and the value of the second can be either £15 or £5, which it is depending on some chance device. If the individual is indifferent between these two gifts when the chance device is such that the probability of the second gift being £15 is ·8 and the probability of it being £5 is ·2 then the ratio between the two utility differences

$$\frac{(\text{utility £15} - (\text{utility £10})}{(\text{utility £10}) - (\text{utility £5})}$$

is defined as $\frac{\cdot 2}{\cdot 8} = \frac{1}{4}$.

That is, if the utility of £10 is given as 100 and the utility of £5 is given as 60 then the utility of £15 is given as 110. It can be seen that $100 = (110 \times \cdot 8) + (60 \times \cdot 2) = 88 + 12$. That is, the utility numbers which are given to the various levels of income are defined so that the mathematical expectation of the utility of the uncertain pair, £15 and £5, is equal to the utility of the certain value, £10. Thus the problem of decision taking under uncertainty is resolved into that of constructing the appropriate utility curve. Once constructed, the necessary behaviour assumption is that the mathematical expectation of this utility is maximised. The drawback to this scheme is that utilities under this definition need only be related ordinally with utilities under certainty which is the way utilities had previously been thought of.† The behaviour assumption that the mathematical expectation of conventional utility is maximised, does not follow from it. This also means that as both conventional utility and risk preference attitudes are both included in the newly defined utility curve that there is no means of taking of risk preference on its own which is clearly a severe limitation (see Coombs and Beardslee(1) and Feather(1)).

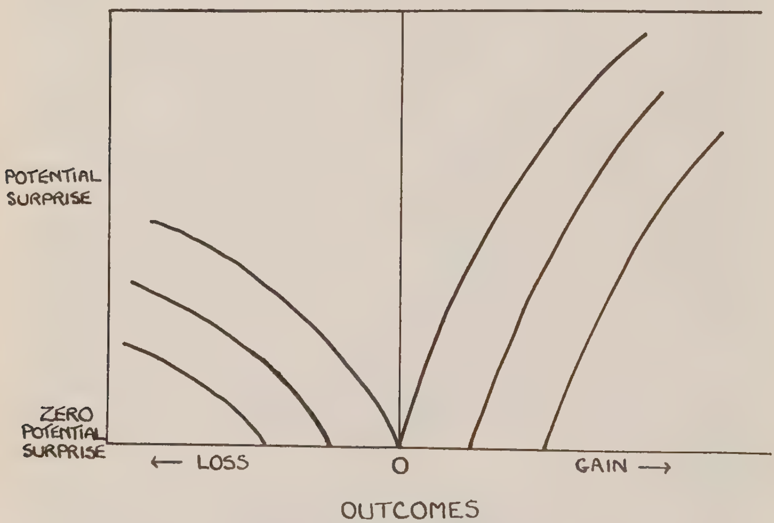
A completely different scheme is proposed by Professor Shackle. The Shackle theory takes the selection of an act from a number of possible acts in two stages. The first stage consists

*For a clear treatment of this see Luce and Raiffa (1). The origin of this notion can be found in Ramsey (1) and its rediscovery in Von Neumann and Morgenstern (1).

†Nor are there any "Welfare" or "degree of happiness" implications in utility as measured in a risk situation.

of the selection for each act of two "focus outcomes" from the consequences of that act. One of these focus outcomes, the focus gain, characterizes the favourable outcomes of a particular act and the other, the focus loss outcome, characterizes the unfavourable outcomes of the act. It is felt by Shackle that the selection of two outcomes to represent all the possible outcomes of an act more accurately represents the thought processes of a decision taker than does a consideration of all possible outcomes individually.

The method of selection of these standardised focus outcomes can be described in terms of the diagram. On the gain side the individual has a set of stimulus indifference curves where the curved lines on the right connect points of given value and given degrees of potential surprise, with points of zero potential surprise which provide the same degree of positive stimulus. The focus gain is that single outcome



from which he gets the most satisfaction in contemplation i.e., the outcome which, with its attendant degree of potential surprise lies on the indifference curve the most to the right, and hence reaches the zero potential surprise axis the most to the right. The equivalent point on the zero potential surprise axis

is called the "standardised focus gain." The decision taker performs a similar process for losses and finds a standardised focus loss. There are thus two values on the basis of which the decision taker makes his decision—a loss value and a gain value.

For the second stage of the decision taking process, Shackle hypothesises a set of indifference curves representing the rate of exchange between focus loss and focus gain. The assumption is very reasonably made that an individual will face a greater focus loss for the prospect of a greater focus gain. This set of indifference curves is called "the gambler indifference map" and reflects the attitude of the decision taker towards risk. A decision taker who dislikes risk will need a higher focus gain to compensate for a given focus loss than will an individual who is of an adventurous temperament. An individual selects an act from amongst several possible acts by taking the focus outcomes of the various acts and placing them in the gambler indifference map. The act with focus outcomes lying on the highest indifference curve will be selected in preference to the others.

In Shackle's system, attitudes to risk appear explicitly in the gamber indifference map. However, it is not necessary to accept Shackle's whole scheme in order to have the element of risk preference or aversion in a model of decision taking. This is quite recognised by many writers on the subject, for example, Vail([1]). It is possible to construct indifference curves between various outcomes at various levels of subjective probability and other points at certainty in order to make comparisons where these "certainty equivalents" are not equal to the mathematical expectation of the uncertain outcome. For a decision taker who disliked risk the certainty equivalent of uncertain outcomes would be less than the mathematical expectation, whereas for the natural gambler, the certainty equivalent would be greater than the mathematical expectation. A model which uses indifference curves of this sort and which has some superficial resemblance to Shackle's is constructed by C. H. Coombs and David Beardslee([1]). Their model is of less wide application than Shackle's in that they do not concern themselves with acts which can have several outcomes. They are really interested

in a gambling situation where there is a stake and a prize, and where either the prize is won or the stake is forfeited. The Coombs and Beardslee model, in using subjective probabilities instead of potential surprise, escapes the dilemmas posed in a potential surprise model by being able to distinguish between outcomes with zero potential surprise where some are thought of as being more likely than others, a situation very likely in gambling situations.

Around the problem of finding which is the most stimulating of various uncertain prospects has arisen what has been called by Professor Carter) "Carter's Error" (See Carter(1) and (2)). Carter's argument starts from the fact that in Shackle's theory, the desiredness of a consequence of an act varies directly with its utility and inversely with its potential surprise. If there are two acts, one with a possible consequence A and the other with a possible consequence B where B has the greater utility but also the greater potential surprise, then the choice between them depends on whether the greater utility of B is sufficient to more than compensate for the greater potential surprise. If potential surprise and utility are capable of being measured cardinally no problem arises, as the appropriate values are fitted into the function to see which gives the larger value for desiredness. However, if, as Shackle says, these variables are only capable of being ordered, then any numbers can be attached to the utilities and potential surprises, with the sole restriction that the numbers given to A must be less than those given to B. Either A or B could turn out to be the most desired on this basis, depending entirely on the arbitrary numbering. This argument is fallacious, as Professor Carter admits, (see Shackle(1) and Gorman(1)). The argument is valid only if the method of combining the potential surprise and utility remains the same whatever arbitrary changes are made in the units of measurement of the two variables. This is a strong restriction which is not necessary. This is a particular instance of the general principle that one cannot handle ordinal "numbers" with the same freedom with which one can handle cardinal numbers and that results true in cardinal mathematics are not necessarily also true when they are applied to ordinal numbers.

Situations without Subjective Probabilities

There are some situations where there does not seem to be any great point in attributing probability numbers to particular outcomes. For example, a duopolist might know that his opponent will do one of two things but he has no idea which, particularly as the opponent is presumed to be trying to do the same sort of mind-reading in his turn. In this sort of situation various criteria for the selection of an act have been suggested. It is basically the situation which would be described by Shackle as being one where all outcomes have zero potential surprise. This problem can be stated in matrix form as follows :

	Situation 1	Situation 2
Act 1	5	2
Act 2	3	3

The decision taker has a choice between act 1 and act 2 in the face of the possibility of either situation 1 or situation 2 occurring. (These situations might be the acts of another decision taker). The numbers represent utilities interpreted as being net of cost; that is, if the decision taker undertakes act 2 and situation 1 in fact occurs, then the net gain of the decision taker is 3 utility units.

The "classical" solution to this involves one of the earliest principles formulated of decision taking under certainty, the "Principle of Insufficient Reason" given by Jacob Bernouilli, in the 18th century. This states that if there is no knowledge of the probability of various different and exclusive states then they should be assumed to be equal. In the example given, situation 1 and situation 2 should be given probabilities of ·5 each. The mathematical expectation of act 1 would then be 3·5 and that of act 2 would be 3·0. If the decision taker acted to maximise his mathematical expectation then he would select act 1 as offering him the greatest. Similarly, any function reflecting risk preference which gave certainty equivalents for outcomes expected with given probabilities could be applied to the matrix.

An alternative view is to make no statement about the probabilities at all and not to make any sort of expectation

approach. A criterion which has had great vogue in recent years is the maximin criterion. This states that the decision taker should select the act which has the highest minimum value. This is a formalisation of a safety first principle. The decision taker will get the best possible result if the worst possible thing happens. In the case of the example given he will choose act 2, for the minimum of this is 3 utility units, whereas the minimum of act 1 is 2 units. This in some ways seems a satisfactory criterion but it can ultra-pessimistic as it does not take into account the favourable results of the acts. In the example, if the result of performing act 1 in a world where situation 1 was the case, were 100 instead of 5, it seems reasonable that the prospect of this gain might tempt the decision taker away from the maximum outcome. Whether this is likely to be so * or not depends on the situation. If the pay-offs to the decision taker come directly from another individual who can choose between situation 1 and situation 2 so that the gains of the decision taker are the losses of the second decision taker, then it seems likely that he will stick to his solution, for he will be aware that his opponent will try to avoid paying out 100 units. However, if this is a game against nature so that the loser of the 100 units (if any) has not the choice of situation 1 or situation 2, or, if he has, is not aware of the consequences, then it is plausible that the decision taker will take a risk and move from his maximin criterion. This limitation appears in an alternative form. A maximin choice is not self-evident. In the case where the matrix of possibilities is as follows :

	Situation 1	Situation 2	...	Situation 100	Situation 101
Act 1	5	5	...	5	2
Act 2	3	3	...	3	3

Act 1 is a plausible choice even though act 2 is a maximin choice.

Another approach is that proposed by L. J. Savage and called (though not by himself) the Minimax Regret criterion (Savage[1]). If it were known in advance which particular situation would occur, then a decision taker would take a particular decision and arrive at a particular outcome. If in

*Or ought to be so : these criteria can be interpreted as being either normative or positive.

fact he has selected a different act then the difference between his actual outcome and the outcome he could have had if he had known the situation in advance can be regarded as a measure of his disappointment. Thus, before the event there is for any act and any situation a "potential disappointment" number and for any act there is a set of these numbers, one for each state which can be regarded as the potential disappointment of the act, or, alternatively, the risk of the act. Thus, for the pay-off matrix given earlier can be constructed a "risk matrix" which will be as follows :

Pay-off Matrix		Risk Matrix	
5	2	0	1
3	3	2	0

The Savage criterion is to minimise the maximum risk or disappointment. In this example he will select act 1 for then the maximum disappointment will be 1 utility unit as against 2 if he selected act 2. The Savage criterion has the disadvantage of being complex and the further disadvantage that it is not necessarily the case that the differences between utilities as derived in the regret matrix do correspond to any index of disappointment or regret.

A further criterion which has been suggested is an "optimism-pessimism index" which is due to Hurwicz, (see Luce and Raiffa(1)). According to Hurwicz a decision taker selects the best and the worst outcome and accords to each a factor which represents his optimism or pessimism and then adds the two together. He suggests a straight line optimism-pessimism index. That is, the minimum possible outcome is multiplied by a factor α which is a number between 0 and 1, and the maximum possible outcome is multiplied by a factor $1-\alpha$. The act selected is that which has the highest index. If the factor α is equal to 1, i.e., the decision taker is of a very pessimistic temperament, then the Hurwicz criterion is identical to the maximin criterion. The Hurwicz criterion has strong points of similarity with the Shackle method of selection of an act. Both concentrate their attention on the worst and the best outcome and suggest that it is in the combination of the two that the decision is considered. The relationship between best and worst outcomes need not be linear as represented above

in the Hurwicz criterion, and if the linearity assumption is relaxed then it achieves the more general form that the Shackle form has.

An obvious drawback of any criterion which focuses attention on only the best and the worst outcomes is that the distribution of other outcomes between the best and the worst is ignored whatever it may be. Consider the following two acts with possible outcomes all at zero potential surprise.

Act 1	..	2	2	4	5	20
Act 2	..	1	17	18	18	19

Both the Hurwicz and the Shackle criterion would suggest the selection of act 2 in preference to act 1, which does not appear to be an obvious choice at all. The selection of act 2 in preference to act 1 has intuitively much to commend it both as a description of actual conduct or as a prescription of rational conduct. This sort of situation represented is likely to be too common to ignore. A similar sort of criticism was made of the maximin criterion and it can be made of any criterion including the Savage criterion, which acts on a limited number of the possible outcomes.

The whole of this section can be interpreted as referring to situations where all the possible outcomes have, in Shackle's terminology, zero potential surprise. Any case where the outcomes do not all have zero potential surprise can be reduced in the manner of Shackle to equivalent sets of utility pay-offs at zero potential surprise and thus be suitable for the applicable of decision criteria of the type which have been discussed in this section. Hence, the whole of this discussion can be conceived of as alternative ways of approaching the second part of the Shackle model, which Shackle does by placing focus gain and focus loss points on a gambler indifference curve.

The disagreements over the most appropriate frame-work in which to develop a theory of decision taking are numerous and some of them fundamental. It seems fruitful to suggest some reasons why this should be so. Part of the reason is that the questions which are asked are different in the different theories. Savage (p. 7) states his purpose thus : "I am about to build a highly idealized theory of the behaviour of a "rational" person with respect to decisions." Shackle on the

other hand wishes to develop a theory which is applicable to a very restricted class of decisions, namely large scale business decisions, and his theory is meant to be descriptive, not normative. Thus, unless the behaviour of business men under such conditions is held to approximate to that of the highly idealized behaviour of "rational" people, which would be an unreal assumption, then agreement between the theories would be improbable. All the disagreements cannot be accounted for in this way however and there are genuine contradictions between the theories. These are due to different assumptions about how people organise information and react to situations. They can in principle be settled by reference to factual information which we do not yet have.

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Correction to "Probability and Decision Taking," M. B. Nicholson, *The Manchester School*, Vol. XXVII, No. 3, September, 1959.

p. 238, line 12, reading "the selection of act 2 in preference to act 1" should read "the selection of act 1 in preference to act 2."

International Trade, Income Distribution, and the Offer Curve

Theoretical analysis of two important problems—the effects of protection on real wages, and the effects of free international trade on factor prices—has clarified the relationship between the commodity prices established in international trade equilibrium and the corresponding prices of factors of production, within the framework of the Heckscher-Ohlin model of international trade.[1] Both the central theoretical principle—that an increase in the relative price of a commodity shifts production towards that commodity and so increases the demand for and marginal productivity of the factor in which the good is intensive—and the diagrammatic apparatus for analysing it—the Edgeworthian production-contract box, and the functional relationship between relative commodity prices and relative factor prices—are now well established in the literature of international trade theory. But the parallel interconnection between the distribution of income between factors and the country's demand for imports, which is one determinant of the equilibrium of international trade, has not so far been explored with the same thoroughness. On the contrary, the offer curve is generally derived without reference to the distribution of income, usually from a set of community indifference curves assumed to be invariant. This assumption implies either a social policy governing income distribution or

[1]For the effect of protection on real wages, see W. F. Stolper and P. A. Samuelson, " Protection and Real Wages," *Review of Economic Studies*, Vol. IX, No. 1 (November, 1941) pp. 62—69, reprinted as chapter 15 in *Readings in the Theory of International Trade*, ed. by H. S. Ellis and L. A. Metzler (Philadelphia, 1949) pp. 335—57 : L. A. Metzler, " Tariffs, the Terms of Trade and the Distribution of National Income ", *Journal of Political Economy*, Volume LVII No. 1 (February, 1949), pp. 1—29 ; K. Lancaster, " Protection and Real Wages : A Restatement ", *Economic Journal*, Vol. LXVII, No. 266 (June, 1957) pp. 199—210 ; and a forthcoming paper by Jagdish Bhagwati, ibid. Some remarks in a preliminary version of this last showed the need for a technique of relating income distribution back to the offer curve and led to the present article. For the relation between international trade and factor prices, see the present writer's " Factor Endowments, International Trade and Factor Prices ", this journal, Vol. XXV, No. 3 (September, 1957) pp. 270—83, reprinted as Chapter I in H. G. Johnson, *International Trade and Economic Growth* (London, 1958) pp. 17—30, which contains references to the earlier literature on the subject.

identity of tastes and factor ownership among residents, both of which make the problem of the effect of trade on factor prices uninteresting. Moreover, without an analysis of the connection between distribution and international demand, the general equilibrium model of international trade is logically incomplete—a state of affairs not only aesthetically unsatisfactory but also (as will appear subsequently) capable of permitting erroneous theoretical conclusions to be drawn.

This article attempts to fill the gap, by introducing the distribution of income between factors into the derivation of the offer curve itself. Part I states the assumptions of the analysis and develops two alternative methods of representing the distributions of income corresponding to points on the transformation curve between commodities; the technique for doing this was originally developed in connection with the general equilibrium analysis of excise tax incidence.[1] Part II derives the country's free-trade offer curve, analyses the nature of international trade equilibrium with a given foreign offer curve and the effects of shifts in the foreign offer curve, and discusses briefly the effect of trade on welfare. The effects of a tariff on the offer curve, international equilibrium and the incomes of factors of production will be the subject of a later article.

Part I. THE DISTRIBUTION OF INCOME

The following analysis assumes, in general conformity with the Heckscher-Ohlin model of international trade, that there are two countries, the home country and the foreign country, producing and trading two commodities, X and Y. For present purposes, the foreign country may be represented simply by its offer curve, expressing the quantities of one good it is prepared to

[1] See Paul Wells, " A General Equilibrium Analysis of Excise Taxes ", *American Economic Review*, Vol. XLV, No. 2 (June 1955), pp. 345—59. Wells gives joint credit for the development of the technique to John Fei. His own exposition of it does not explore the role of income distribution and factor-owners' tastes in the determination of general equilibrium, introducing instead a superfluous apparatus of contract curves; and he errs in treating the division of income as a *pro-rata* allocation of each commodity between factor-owners, who are assumed to trade with each other. See H. G. Johnson, " General Equilibrium Analysis of Excise Taxes: Comment," *American Economic Review*, Vol. XLV, No. 1 (March, 1956) pp. 151—6, for criticism of Wells' treatment and an early version of the technique developed below.

exchange for quantities of the other at the price expressed by the ratio of the two quantities ; the foreign offer curve will be assumed to have the normal Marshallian shape. The home country is assumed to have a fixed endowment of two factors, labour and capital, which can be used according to given production functions to produce the two commodities ; each production function is assumed subject to constant returns to scale and diminishing marginal rate of substitution between factors, and X is assumed to be more labour-intensive than Y. Perfect competition is assumed, so that factors are paid the values of their marginal products, which are equal in the two industries ; and the tastes of the factor owners are assumed to be given, and describable, for each factor separately but not for the two together, by a set of indifference curves of the normal shape, neither good being "inferior" in the consumption of either factor. It is further assumed that foreign demand is such that X will be the home country's import good, and Y its export good.

The home country's factor endowment and the available technology determine its production possibilities, which can be represented by a transformation curve between the two commodities. For each combination of the commodities on the transformation curve, there is an allocation of labour and capital between the two industries, a corresponding ratio between their marginal productivities common to the two industries, and, since their quantities are fixed, a corresponding distribution of the national product between them. Since there are only two factors, this distribution can be conceived of in terms of the total output, and the income earned by one factor, since the residue is the income of the other. The income earned by a factor, in turn, can be envisaged in two alternative ways : as an amount which the factor itself produces, and as a share of the total which both factors together produce. The former notion leads to the concept of a "production block" representing the income the factor would produce for itself at different relative commodity prices, the latter to the concept of an "income-distribution curve" showing the share of total output the factor would receive at different points on the country's transformation curve. Both of course amount to the same thing, but each has its own advantages and disadvantages.

The concept of the income-distribution curve is fairly obvious, as is its chief characteristic : that the share of a factor rises as production shifts along the transformation curve towards the good which uses that factor relatively intensively. The concept of a factor's production block requires more explanation, since factors always produce in co-operation with each other ; and it involves introducing the concept of negative production of a commodity. But the central idea is simply an extension of existing analysis, notably the Rybczynski proof[1] that if commodity prices are constant, an increase in the supply of one factor must reduce production of the good which uses that factor relatively less intensively.

The initial problem is to determine, given the amounts of X and Y produced by the economy with both factors together, how much X and how much Y can be said to be produced by one factor—say labour—alone. The answer is derived along the following lines : At the factor prices corresponding to the total quantities of X and Y produced in the economy, there is an optimum capital: labour ratio in each industry, and this ratio is higher in Y than in X by assumption. Now suppose all labour is employed in producing X ; to do so efficiently, labour must be assisted by capital in the optimum ratio. Where is this capital to come from ? Suppose that negative production of Y is possible ; this will release capital and labour, which can be put to producing still more X ; and since the capital : labour ratio in Y is higher than in X, there will be a net release of capital which can be put to co-operating with the initial stock of labour. Thus labour can be conceived of as contributing to total production a positive quantity of the labour-intensive good (larger than the economy's actual production of it) and a negative quantity of the capital-intensive good, the negative production of the latter providing all the capital and some of the labour required to produce the former. Similarly, capital can be conceived of as producing a positive quantity of the capital-intensive good (larger than the economy's actual output of it) and a negative quantity of the labour-intensive good ; and total output of each good can be conceived

[1]T. M. Rybczynski, " Factor Endowment and Relative Commodity Prices ", *Economica*, New Series, Vol. XXII, No. 88 (November, 1955), pp. 336—41.

of as comprising a positive contribution by one factor and a negative contribution by the other. The combinations of positive quantities of one good and negative quantities of the other " produced " by a factor at different points on the economy's transformation curve constitute the " production block " for the factor; like the transformation curve, and for the same reasons, the production block will be characterized by a diminishing marginal rate of transformation of one good into the other.

The derivation of the income-distribution curve and the factor production blocks just described from the factor endowment and technology of the economy is illustrated in Figure 1, which reproduces the familiar production contract box. $O_xA = O_yB$ represents the economy's labour endowment, $O_xB = O_yA$ its capital endowment; production indifference curves for X originate at O_x, for Y at O_y, their tangency points tracing out the production contract curve O_xPO_y. Initially, production is at P, with O_xP of X and O_yP of Y being produced, the price of capital in terms of labour being the slope of the common tangent FF, and the labour: capital ratios in the two industries being the slopes of O_xP and O_yP (with respect to the horizontal).

The shares of the two factors in the national product are determined by drawing O_yA' parallel to FF : AA' is the value of capital's contribution to production, measured by the quantity of labour it will command, whereas O_xA is the value of labour's contribution measured the same way; hence AA'/O_xA' is capital's share, and O_xA/O_xA' is labour's share, in total income. As the production point shifts towards O_y, more X and less Y being produced, the labour : capital ratio in both industries declines, the slope of FF consequently decreases, labour's share rises and capital's share falls ; and conversely when the production point shifts towards O_x, more Y and less X being produced.

To derive the points on the factor production blocks corresponding to total production of O_xP of X and O_yP of Y, draw AP_L parallel to O_yP and AP_c parallel to O_xP to the north-east and south-west of A respectively ; distances along these lines from A represent negative production of Y and X respectively. The intersections of these lines with O_xP and O_yP produced give the production points for labour and capital respectively ;

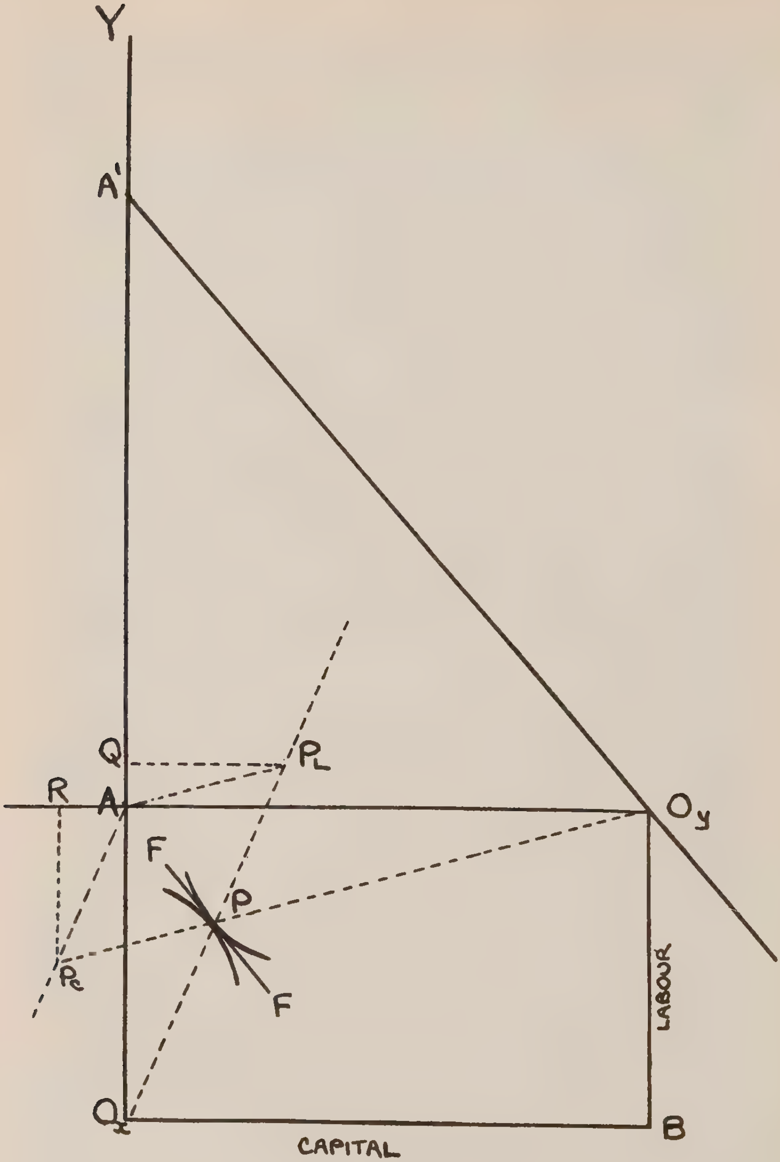

Fig 1

negative production of AP_L of Y releases QP_L of capital and QA of labour, which together with O_xA of labour can produce O_xP_L of X; similarly negative production of AP_c of X releases RP_c of labour and RA of capital which together with O_yA of capital can produce O_yP_c of Y. The points on the factor production blocks corresponding to the other points on the contract curve may be derived in the same fashion.

The relationship between the transformation curve, the income distribution curve, and the factor production block is shown in Figure 2, with labour as the factor whose income or income share is of special interest. In the Figure, TT is the transformation curve for the economy as a whole, WW' the income-distribution curve, and LL the labour production block. WW' is so drawn that it intersects the vector from the origin to any point on the transformation curve in the ratio in which income is divided between labour and capital; for example, if production is at P_1 and the intersection at W_1, labour's share is OW_1/OP_1. The income actually received by labour is obtained by drawing the budget line through W_1 parallel to the tangent to the transformation curve at P_1. Alternatively, labour's budget line is given by the tangent to LL (at L_1) which has the same slope as the tangent to the transformation curve at P_1; and its share can be obtained by finding the intersection of the vector OP_1 with this budget line. Thus the income-distribution curve can be derived directly from the factor production block; the converse derivation, though possible in principle, can be regarded as impossible in geometrical practice. It should be noted that the WW' curve may rise from left to right over part of its range—this is consistent with the requirement that the budget line through each point W_1 must lie outside the budget line through any point on WW' left of W_1; also that, once the country becomes completely specialized, the LL curve becomes irrelevant, and distribution is fixed at the relevant extreme point on the WW' curve.

The factor production block technique has the advantage of relating distribution to production directly and so avoiding possible errors: the income-distribution curve has the advantage of diagrammatic simplicity, and of remaining relevant when the country is completely specialized. The income-distribution

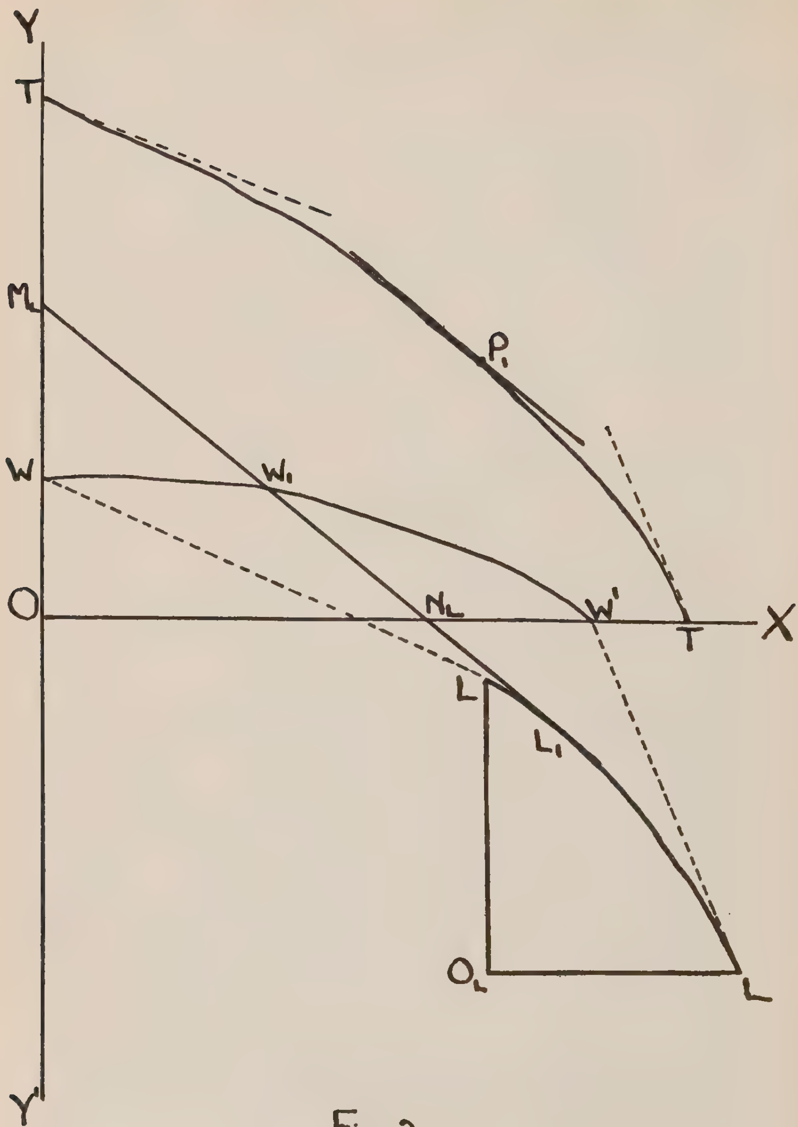

Fig. 2.

curve will be employed in the remainder of this article. Both techniques can readily be extended to the case of distribution between two factor *owners* owning the factors in different ratios. In this case, part of the factor (i.e. factor-owner) production block may intrude into the north-east portion of Figure 2.[1] If factors are owned in the same ratio as the country's overall endowment, the income-distribution curve becomes a contracted form of the transformation curve, distribution is constant, and analysis in terms of the transformation curve and a community indifference curve becomes legitimate.

Part II.

THE OFFER CURVE AND FREE TRADE EQUILIBRIUM

The offer curve shows, for each international price ratio between the commodities, the quantity of exports the country would supply and the quantity of imports it would demand in exchange. Under free trade, the internal price ratio is the same as the international (external) ; and the point on the offer curve corresponding to a particular international price ratio represents the excess of the quantity of one good that the country would produce over what it would consume, and the excess of the quantity of the other it would consume over what it would produce, at that price ratio. Given the price-ratio, which determines the country's production point and the distribution of income between the factors, the consumption of the two goods and therefore the point on the offer curve corresponding to the price ratio is determined by the preference systems of the factors. An increase in the relative price of the imported good has in addition to the usual income and substitution effects, the effect of shifting domestic production towards producing more of that good and less of the export good, and re-distributing income towards the factor used relatively intensively in producing that good, thus altering the weights of the preference systems of the two factors in determining aggregate demand for the goods. While the income,[2] substitution, and production effects of the price increase will tend to reduce the quantity demanded, the re-distribution

[1]See H. G. Johnson, " General Equilibrium Analysis of Excise Taxes : Comment," *loc. cit.*

[2]Inferior goods are excluded by assumption.

effect may work in either direction. It will tend to reduce the quantity demanded if each factor prefers the commodity which employs it relatively less intensively, and to increase the quantity demanded if each factor prefers the commodity which employes it relatively more intensively, " preference " being defined as having a higher marginal propensity to consume the good than does the other factor.[1] In the latter case, the re-distribution effect may outweigh the other effects over a certain range of the offer curve, so that the quantity of imports demanded increases as their relative price rises and decreases as their relative price falls, thus producing the equivalent of the " Giffen case " even though imports are by assumption not an inferior good. It is even possible that, as the price of the imported good falls, the re-distribution effect will convert the country from an importer to an exporter of the good concerned, though again this can only occur over a certain range of the offer curve, as at a sufficiently low price the country must specialize on the other good and rely on imports for its consumption of this one. The re-distribution effect therefore introduces new possibilities of instability and multiple equilibrium not suggested by the standard offer curve analysis.

The derivation of the offer curve is illustrated in Figure 3 which reproduces the transformation and income-distribution curves of Figure 2. The indifference curves for labour are drawn in the usual north-east direction, with the fixed origin O, and the quantities of X and Y demanded by labour are determined by the tangency of an indifference curve with labour's budget line as given by the production point on the transformation curve and the income distribution curve. The indifference curves for capital, on the other hand, are drawn in the south-west direction from the shifting origin of the production point on the transformation curve ; and the quantities of X and Y demanded by capital are determined by the tangency of one of these indifference curves with labour's budget line, determined as above, which represents capital's budget line viewed from the point on the transformation curve as origin. The excess or deficit of the total quantity of a good demanded by both factors together, as compared with the

[1] " Preference " in this sense may be the consequence of differences in either tastes or level of income.

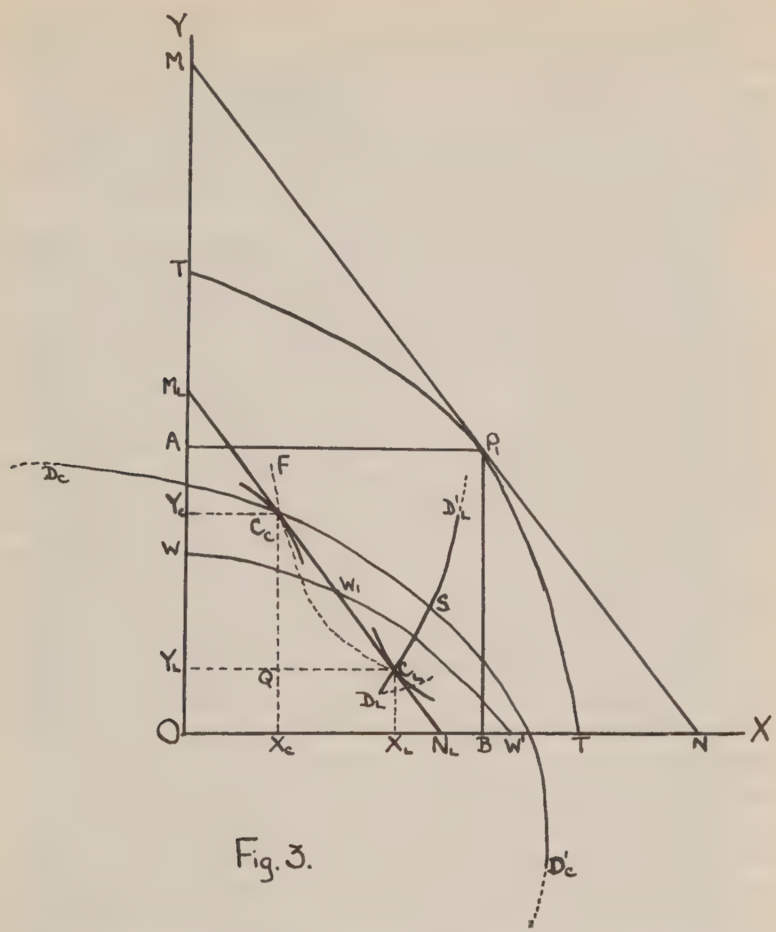

Fig. 3.

amount of it produced, is the country's import demand or export supply of it, and is measured by the overlap or gap between the two factors' consumption points with respect to the axis for that good.

Thus, in Figure 3, with the price ratio equal to the slope of MN, the production point is P_1, with OB of X and OA of Y being produced, total income is given by the budget line MN, and labour's budget line is M_LN_L. Labour's consumption point is C_L, involving a demand for OX_L of X and OY_L of Y; capital's consumption point if C_c, with capital demanding BX_c of X and

AY_c of Y. There is therefore an excess of demand for X over domestic production (a demand for imports) of X_cX_L, and an excess of production of Y over domestic demand (a supply of exports) of Y_cY_L, at the given price ratio. More simply, at the terms of trade given by the slope of C_cC_L, the country will supply exports of C_cQ of Y in exchange for imports of C_LQ_c of X—$C_cQ\,C_L$ is the country's " trade triangle ".

As the relative price of X rises, the production point shifts to the right along the transformation curve, and income is redistributed towards labour, the position of the trade triangle shifts to the right and its dimensions alter. The changes in exports supplied and imports demanded as the relative price of imports rises are most conveniently analysed in terms of the behaviour of C_L and C_c, the vertices of the trade triangle, as the production point shifts along the transformation curve. The loci of C_L and C_c are shown in Figure 3, for the range of variation of the relative price of X from that resulting in complete specialization on Y to that resulting in complete specialization on X, by D_LD_L' and D_cD_c' respectively.[1] D_LD_L' must rise as C_L moves along its from D_L, since both the increasing income of labour and the rising relative price of X must increase labour's consumption of Y; if the substitution effect is strong enough, labour's consumption of X will decrease, and D_LD_L' bend back on itself. The slope of D_cD_c' is not so rigidly determined since the movement of C_c as the relative price of X rises is the net outcome of conflicting forces. Both the production effect and the substitution effect of an increase in the price of X will tend to move C_c to the south-east, giving a downward slope to D_cD_c'; but the associated reduction in the income of capital will tend to move C_c to the north-west, giving an upward slope to D_cD_c'; so that the net effect may be either an upward slope or a downward slope, at a particular price of X. But D_cD_c'

[1]Once the country is completely specialized in one industry, the distribution of income between the factors is rigidly fixed by their relative marginal productivities in that industry, and shown by the relevant terminal point of the income-distribution curve. As the price of X varies beyond that at which specialization occurs, the budget line rotates about the terminal point of the WW curve, and both factors gain from the cheapening of the imported good. The continuations of D_LD_L' and D_cD_c' after specialization occurs are shown in Figure 3 by the dotted lines; the shapes of these curves are determined by the usual income and substitution effects.

can only slope upwards over a certain range, since, as is clear from the diagram, C_c must lie to the north-west of W at the one extreme (D_c) and to the south-east of W' at the other (D_c').

If D_cD_c' slopes downwards throughout, both sides of the trade triangle diminish as the price of X increases; and the country's offer curve has the normal ("elastic demand for imports") shape, less of X being demanded and less of Y supplied as the price of X rises (Y falls). But if D_cD_c' slopes upwards in the relevant range, abnormal shapes of the offer curve become possible: (*a*) the vertical side of the trade triangle may increase as the price of X increases, indicating an increase in the quantity of Y supplied as the price of X rises ("inelastic demand for imports"); (*b*) both sides of the trade triangle may increase as the price of X increases, indicating an increase in the quantity of X demanded as its price increases ("perverse elasticity of demand for imports"); (*c*) as the price of X decreases, the trade triangle may shrink to nothing and invert over a certain range before reverting to normal ("perverse reversal of trade direction").[1] This last possibility requires that D_cD_c' and D_LD_L' intersect three times, which means that there are three possible closed-economy equilibrium points, at successively higher prices of X and larger incomes for labour, of which the middle one is unstable.[2]

The possibility that the quantity of imports of X demanded will increase as the price of X increases, common to cases (*b*) and (*c*) above, is illustrated in Figure 4, which is designed to demonstrate, in a general way, the conditions required for that possibility to emerge. With the price of X shown by the slope of M_LM_L, the production point is P, labour's budget line M_LM_L, and the trade triangle $C_cQ\,C_L$; when the price of X rises to that shown by the slope of $M_L'N_L'$, the production point shifts to P', labour's budget line $M_L'N_L'$, and the trade triangle is $C_c'Q\,C_L'$, such that $Q'C_L'$, the new quantity of imports demanded, is greater than QC_L, the quantity formerly demanded.

[1] Since the country must specialize completely on the production of X at a sufficiently high price, importing its requirements of Y, there must be a reversal of trade direction as the price of X rises.

[2] There may be a larger (odd) number of intersections of D_cD_c' and D_LD_L', and a corresponding number of reversals of trade direction as the price of exports rises.

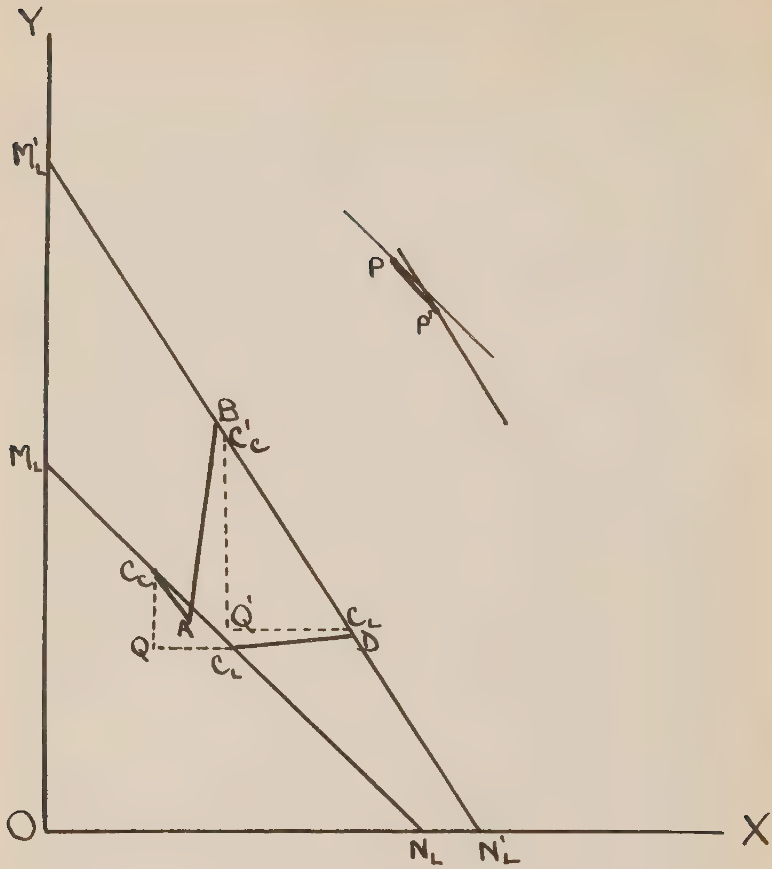

Fig. 4.

The shift of labour's consumption point from C_L to C_L' can be divided into two parts: C_LD, the " income-re-distribution effect " of the price change, defined as the change in labour's consumption that would have occurred if labour had been moved to its new budget line but prices kept constant by appropriate

tax and subsidy arrangements; and DC_L', the "cost-compensated substitution effect" of the price change.[1] Similarly, the shift of capital's consumption point can be divided into three parts: C_LA, corresponding to the shift in the origin of capital's indifference curves from P to P' due to the production effect of the price change; AB, the income-redistribution effect of the price change on capital's consumption; and BC'_c, the cost-compensated substitution effect of the price change. It is obvious from the diagram that the necessary condition for the country's demand for imports to increase is that AB should be steeper than C_LD; that is, that as income is re-distributed from capital to labour, capital should reduce its consumption of Y more, and of X less, than labour increases its consumption of these goods. In other words, each factor must have a preference for (relatively higher marginal propensity to consume) the commodity which employs it relatively more intensively. The diagram also suggests that the case is more likely, the smaller the substitutability of the goods in consumption, the smaller the production shift, and the larger the re-distribution of income between the factors. The last two points clearly go together, since both depend in the same way on the substitutability of factors in production.

The equilibrium volume and terms of international trade are determined by the intersection of the home country's offer curve with the foreign offer curve. The determination of international trade equilibrium can be depicted in either of two

[1]In principle, two income effects of a price change are discernible, one operating by changing the purchasing power of a given income—the income-effect of consumer theory—and the other operating by re-distributing income between the factors. In the present model there seems to be no point in distinguishing them. The effort to do so would in fact create unnecessary complexities, since if the point on the income-distribution curve is taken to define labour's initial income, and the budget line through it rotated to represent the non-re-distributive effects of the price change, the consumption income effect will be positive or negative according as C_L is initially above or below that point on the budget line—that is, if its share is constant labour gains from an increase in the price of X if it consumes a larger proportion of Y as compared with X than the economy produces, and conversely. The same proposition applies to capital, though both factors taken together must lose by an increase in the price of X, since X is imported. Since the consumption income effect of a price change is ambiguous and the total effect is not, the latter is evidently the better to work with.

ways. One is to introduce the foreign offer curve into Figure 3, the technique being to slide the origin of the foreign offer curve along $D_L D_L'$ (or $D_c D_c'$) until its intersection with $D_c D_c'$ (or $D_L D_L'$) lies on the labour budget line through its origin; for example if the foreign offer curve were $C_L C_c F$ in Figure 3, $C_L Q\ C_c$ would represent the equilibrium volume and terms of trade. The other method is to draw the two offer curves on a separate diagram. The first has the advantage of relating trade equilibrium directly to the distribution of income, while the second facilitates the analysis of the nature of equilibrium and the effects of changes in trade conditions on it.

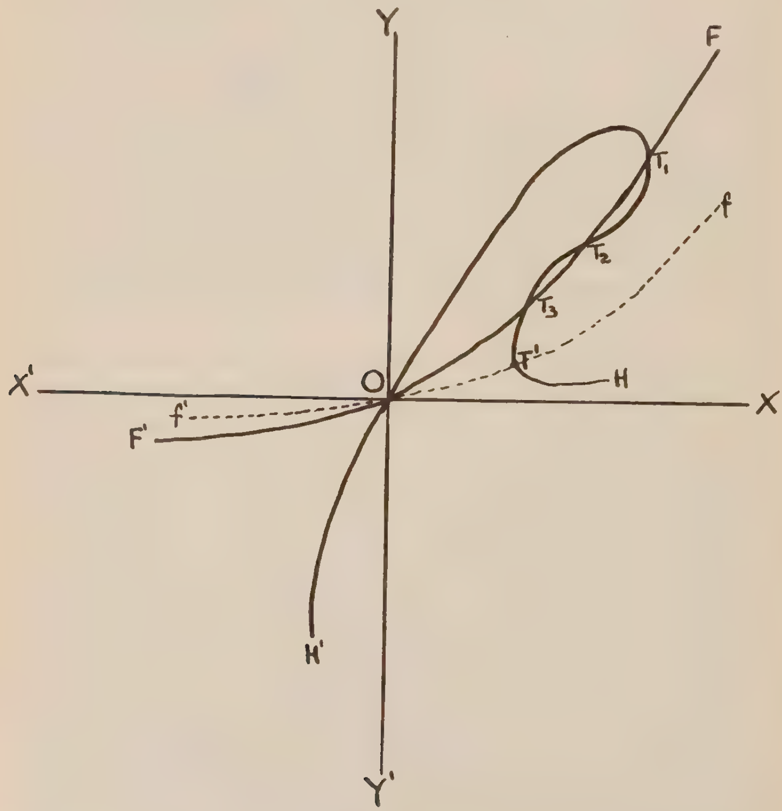

Fig. 5

The new possibilities introduced by taking explicit account of the distribution of income in the derivation of the offer curve are the cases (*b*) and (*c*) mentioned above. Case (*b*) introduces the possibility of multiple equilibria, and unstable equilibrium, even when the foreign demand for the country's exports is elastic—on the usual analysis, both demands must be inelastic for multiplicity and instability of equilibrium to be possible. It also allows the possibility that an increase in foreign demand will lead to a reduction in the volume of both goods traded between the two countries. These possibilities are illustrated in Figure 5. where $H'OH$ is the home offer curve, and $F'OF$ is the (elastic) foreign offer curve ; T_1, T_2, T_3 are possible trade equilibrium points, T_2 being unstable ; and an increase in foreign demand to f′ O f would shift the equilibrium to T', at which point smaller quantities of both goods are exchanged, at terms of trade more favourable to the home country.

Case (*c*) is the more interesting. The offer curve in this case, which is represented in Figure 6 by the curve $H'\,O\,M\,O\,N\,O\,H$, makes a closed loop in both the north-east and south-west quadrants of the diagram.[1] This allows not only the previous possibility of three equilibria in which the country exchanges Y for X, but also the possibility of two stable equilibria, one at a relatively high price of X in which the country exports Y in exchange for X, and one at a lower price of X in which the country exports X in exchange for Y, exemplified by T_1 and T_2 in Figure 6. There will or will not be another, unstable, equilibrium position between the two stable equilibrium points, according as the foreign offer curve does or does not lie outside one of the loops in the neighbourhood of the origin. Moreover with an offer curve of this shape, it is possible that an increase in the foreign demand for a country's export good will lead to a reversal of trade direction, the country becoming an importer of its former export good and an exporter of its former import good. This possibility is illustrated in Figure 6 by the effect of an increase in foreign demand from $f_1'\,Of_1$ to $f_2'Of_2$, which alters the trade equilibrium from t_1, at which point the country is importing X at a relatively high price, to t_2, at which point the country is exporting X at a relatively low price.

[1]A larger number of closed-economy equilibrium points would give rise to an offer curve of an even more intricate floral pattern.

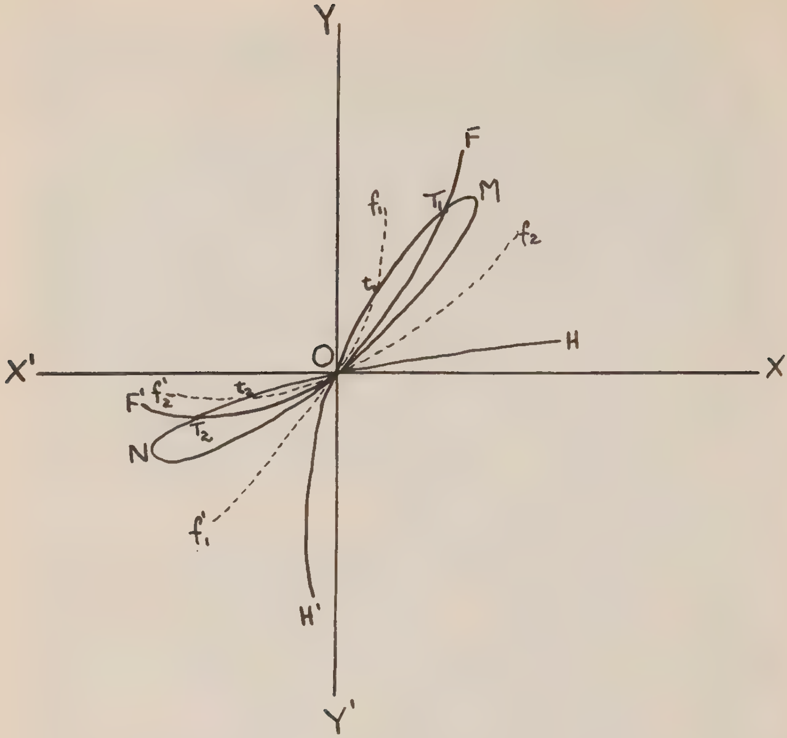

Fig. 6.

In conclusion, a few brief remarks on the gains from international trade are appropriate. The effect of free international trade, as compared with self-sufficiency, is normally to raise the real income of one factor and reduce the real income of the other. The exception is the extreme case of trade which leads the country to specialize completely on the production of one of the goods, *and* establishes a price for that good sufficiently above the price at which complete specialization is profitable for the factor whose income in terms of exportables is reduced to be more than compensated for the loss by the relative cheapening of imports. Excluding the exceptional case, free trade benefits one factor and damages the other. Whether free trade, as compared with self-sufficiency, benefits or harms the nation as a

whole is therefore a question whose answer requires a balancing of gains against losses, and can only be decided by reference to the country's social welfare function.[1] In the absence of a social welfare function, the question can only be discussed in terms of potential welfare, that is, of whether it would be possible by transfers between factors (compensations) to make both factors better off (in the limit, no worse off) under free trade than in the absence of trade. This in turn requires a definition of what the change introduced by free trade consists in. If it is taken to consist in the change in the actual collection of goods available for the economy's consumption, it is possible that the collection of goods purchased in the free trade equilibrium could not be re-distributed so as to make both factors as well off as they would be with the self-sufficiency collection.[2] But if, as seems more

[1]It is arguable that the social welfare function should be deduced from the revealed preferences of the community, as expressed in governmental decisions, rather than imposed (or denied existence) by the observing economist. Governmental decisions show a preference for trade over no trade, but not for free trade over trade subject to governmental interference.

[2]See Erling Olsen, " Udenrigsehandelens Gevinst," *Nationalokonomisk Tidskrift*, Årgang 1958, Haefte 1—2, pp. 76—9, which criticizes Samuelson's classic article on " The Gains from International Trade " (*Canadian Journal of Economics and Political Science*, Vol. V, pp. 195—205, reprinted in *Readings in the Theory of International Trade*) on these grounds. Olsen does not seem to appreciate the distinction drawn here between the opportunity to trade, on which Samuelson bases his argument, and the collection of goods made available by trade, on which his criticism of it is based; for a more elaborate development of the distinction, see R. E. Baldwin, " The New Welfare Economics and Gains in International Trade," *Quarterly Journal of Economics*, Vol. LXVI, No. 1 (February, 1952), pp. 91—101.

The possibility that the collection of goods obtained in trade cannot be re-distributed to make both factors as well off as before can be illustrated by an elaboration of Figure 3. Through S, the self-sufficiency equilibrium point, passes a price-line to which indifference curves for each factor are tangent. Free trade displaces total production north-west along the transformation curve to the left of P_1, and total consumption south-east of the new production point along a line parallel and equal to C_cC_L, thus shifting the no-trade point on capital's indifference system (drawn with reference to the post-trade collection of consumption goods) somewhere to the right of the original price-line through S. If the new location of capital's no-trade consumption point is north-east or south-west of S, capital's original indifference curve may fail to intersect with labour's original indifference curve, in which case capital cannot compensate labour for the effect of trade without being worse off.

sensible, it is taken to consist in the opportunity to trade, either at the free-trade price ratio or along the foreign offer curve, it can easily be shown that the country is potentially better off with free trade than under self-sufficiency, since on either assumption the effect of free trade is equivalent to an outward movement of the country's transformation curve.[1]

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[1]Except at the point on the transformation curve with slope equal to the foreign self-sufficiency price ratio (or, if there is no such point, at one extreme of the transformation curve). For demonstration, see R. E. Baldwin, "Equilibrium in International Trade: A Diagrammatic Analysis," *Quarterly Journal of Economics*, Vol. LXII, No. 1 (February, 1948), pp. 748—62.

The Periodicity and Stability of Inventory Cycles in the U.S.A.—II[1]

I

In the first part of this article it was shown that a Metzler type of inventory cycle model, when modified to allow for separate treatment of the trade and manufacturing sectors, produced the following 5th order difference equation

$$\begin{aligned} 0_t = {} & [a_1 + a_2 (1 + \lambda + \beta_1)]\ 0_{t-1} - a_2 (\lambda + \beta_1)\ 0_{t-2} \\ & + a_2\beta_2(2 + \beta_3)\ 0_{t-3} - a_2\beta_2 (3 + 2\beta_3)\ 0_{t-4} \\ & + a_2\beta_2 (1 + \beta_3)\ 0_{t-5} + A_t, \end{aligned} \tag{6}$$

where 0_t is output produced in period t, a_1 and a_2 are the marginal propensities to consume services and manufactured goods, β_1, β_2, β_3, are marginal inventory-sales ratios and A_t is output of fixed investment goods in period t, all variables being deviations from an initial equilibrium. It is now intended to test this model, and modifications of it, for periodicity and stability to see whether the theoretical model is capable of explaining the typical 2—4 year short cycles of production in the U.S.A. This procedure involves an estimate of the calendar length of the unit period of the model and reasons were given in the first part for assuming that the length of the multiplier period would be between 2 and 4 months with a probable average length of 3 months. Since the values of the parameters of the model in equation (6) have not been invariant over the period from the 1920's to the 1950's, but have been reasonably stable for certain sub-periods it seems desirable to test the model separately for each sub-period beginning with the period of the 1920's.

II

For the 1920's, the following values of the parameters are used: $a_1 = 0{\cdot}25$, $a_2 = 0{\cdot}46$, $\lambda = 0{\cdot}65$, $\beta_1 = 0{\cdot}78$, $\beta_2 = 0{\cdot}56$,

[1]Part 1 appeared in the May issue of this Journal.

$\beta_3 = 1{\cdot}20$,[1] the unit period being 3 months. With these values inserted into equation (6) we have the following empirical equation

$$0_t = 1{\cdot}368\ 0_{t-1} - 0{\cdot}658\ 0_{t-2} + 0{\cdot}824\ 0_{t-3} - 1{\cdot}391\ 0_{t-4} + 0{\cdot}567\ 0_{t-5} + A_t. \quad (7)$$

Using the test sequence procedure discussed in part I[2] the equation indicates a cycle with a length of approximately 13 unit periods or 3¼ years. The cycle is unstable, the deviations from the equilibrium level at successive peaks increasing by 11%. If the multiplier period is taken as 3½ months, and the parameters of equation (7) are modified accordingly, the model produces a stable cycle with a length of 12½ unit periods or 44 months, the deviations at successive peaks declining by about 35%. Shortening the multiplier period to 2½ months gives a cycle of 13½ periods or 34 months, but markedly explosive, the deviation at successive peaks being raised by a factor of 2·2[3]. The final version of the 2nd order model, presented in part I,[4] gave, for a multiplier period of 3 months, an explosive cycle of 3 years with deviations

[1]The values α_1 and α_2 are obtained by the method used in part I p. 161. The values of the β's are derived from the appropriate marginal inventory-sales ratios presented in the Appendix to part I ; they assume all error concentrated in the inventory estimates, which seems reasonable. In adjusting β_1 and β_2 for the time dimension all significant figures in the regression estimates have been used. The value for λ is estimated from Kuznets, *National Product since* 1869, pp. 90, 93, 95, 97, by comparison of totals of consumption of manufactures at producers' and at final prices for the period 1919/38. The ratio of values in 1929 prices was taken as this seems the more direct estimate ; the actual ratio is 153·9 giving $\lambda = 0{\cdot}65$.

[2]p. 166.

[3]Since the stock-sales lag in the manufacturing sector of the model varies with the length of the multiplier period the range of period considered has been shortened to 2½—3½ months. This avoids the need to change the structure of the model whilst preserving a reasonably correct stock-sales lag in the manufacturing sector. The true average length of the multiplier period probably lies within this range. As a check on the extreme limits of the length of the cycle the equation for a two month period has been calculated with a 3 period stock-sales lag for the manufacturing sector. The equation yields a theoretical cycle of 16 unit periods or 32 months and is extremely unstable with deviations at successive peaks increasing by a factor of more than 4. Since the length of the cycle for a 3½ month period is almost equal to the upper limit of the range of the observed short cycle, viz., 4 years the theoretical length of the cycle for a 4 month period is not of great interest. However, we may deduce from other cases examined that the upper limiting value for a 4 month period would be about 48 months.

[4]p. 162.

from the equilibrium level at successive peaks increasing by about 11%. Evidently the two-sector model gives roughly the same degree of instability but a slightly longer cycle. The increase in the effective value of the inventory accelerator which results from the separation of the trade and manufacturing sectors which might have been expected to increase the amplitude of the cycle[1] is therefore offset by the damping effect of the extra lags involved in the 2-sector model.

It is desirable to check the sensitivity of the behaviour of the model to changes in the basic parameters since these may have been estimated inaccurately. The effects of changes in the β's may be seen easily by reinterpreting the $2\frac{1}{2}$ and $3\frac{1}{2}$ month period models as 3 month models with the appropriate changes in the β's. On this basis raising β_1, and β_2 by 20% lengthens the cycle by only $\frac{1}{2}$ of a unit period but makes it considerably more unstable. Reducing the β's by 14% reduces the length of the cycle by only $\frac{1}{2}$ of a unit period and gives a definite gain in stability. The length of the cycle, though not the degree of stability, is therefore insensitive to small variations in the values of the inventory-sales ratios. This conclusion is consistent with Metzler's earlier discussion of the 2nd order model.[2] The length of the cycle is, however, quite sensitive to changes in the structure of the model. Thus, in the 3 month case, a reduction of the manufacturers' stock-sales lag to 1 unit period reduces the model to a 4th order equation which can be solved, approximately, to yield an explosive cycle of about $11\frac{1}{2}$ periods. If the manufacturers' lag is raised to 3 unit periods the 6th order equation yields a stable cycle with a a length of about $14\frac{1}{2}$ periods the main cycle being modified by additional sub-cycles of 4 units length. Examination of the quarterly data for manufacturers' sales and inventories suggests that a variable stock-sales lag may be an important cause of variations in the length of inventory cycles. On the basis of Metzler's discussion we should expect the length of the cycle to be more responsive to changes in the value of the marginal propensity to consume, and this is the case. It seems unlikely that the true value of the

[1] *Cf.* part I, p.163.

[2] *Review of Economics and Statistics*, Feb. 1947, " Factors Governing the length of Inventory Cycles." Charts 1 and 2. The conclusion is valid only for values of the marginal propensity to consume below, say, 0·7.

parameter α_2 should exceed the regression value for the 1920's but it is conceivable that part of the apparent income-induced increment of consumption was related to population growth or some other variable. If α_2 is taken as 0·40, a reduction of 13% in the previously assumed value the length of the cycle becomes 12 periods or 3 years for a 3 month unit period and the cycle is damped with deviations at successive peaks declining by about 35%. Reductions in α_1 also shorten the cycle but have very little effect on the stability of the model.

On the question of periodicity the theoretical model based on a 3 month unit period seems consistent with the actual short cycles of the 1920's, the average length of the three cycles between the peaks in the Federal Reserve index of manufacturing production of February, 1920 and July, 1929 being approximately 3 years and 2 months. On the question of stability, however, the behaviour of the theoretical model is inconsistent with the actual cycles since the declining amplitude of the 1923/24 and 1926/27 recessions is hardly in accord with an explosive pattern. The theoretical cycle can be damped if the length of the unit period is assumed to exceed 3 months but stability is then gained at the expense of a discrepancy in the length of the cycle. If the actual length of the unit period is less than 3 months the degree of instability is so great that the validity of the model must be questioned.

It is possible to secure a closer consistence of the theoretical and actual cycles for the 1920's in two ways, apart from the convenient *ad hoc* assumption of appropriate errors in, say, the estimate of α_2 or the operation of random factors. The first way involves recognition of a measurable change in the value of the manufacturers' inventory-sales ratio after 1923, and the second involves minor changes in the structure of the model which have a stabilising effect.

For the period 1924/28 the value of the marginal inventory-sales ratio in the manufacturing sector is substantially less than the value used in equation (7) relating to the whole period of the 1920's, the actual values of β_2 being 0·325 and 0·56 respectively, on a quarterly basis. The remaining parameters are unchanged for the sub-period 1924/28. If the modified value of β_2 is inserted into the basic equation (6) the empirical difference equation for a

3 month unit period becomes

$$0_t = 1{\cdot}368\,0_{t-1} - 0{\cdot}658\,0_{t-2} + 0{\cdot}478\,0_{t-3} - 0{\cdot}807\,0_{t-4} + 0{\cdot}329\,0_{t-5} + A_t. \quad (8)$$

A test sequence indicates that this equation yields a cycle of 12 periods, or 3 years, and is non-explosive, the deviations at successive peaks declining by about 45%. Thus, if the data can be accepted, the comparative insensitivity of the periodicity of the cycle to changes in the inventory-sales ratios means that considerable damping can be introduced into the theoretical cycle for the period 1924/28 without sacrificing consistency of periodicity.

Some gain in stability may also be achieved by amending the basic model to allow for the existence of distributed lags in the operation of the desired inventory change in the manufacturing sector, an assumption which does not seem implausible.[1] Two versions of this alternative model may be considered. The first involves a 2 period distributed lag and the equation describing the desired inventory change in the manufacturing sector becomes :—

$$\begin{aligned} P_t^M &= \beta_2[\tfrac{1}{2}(R_{t-2}^T + R_{t-3}^T) - \tfrac{1}{2}(R_{t-3}^T + R_{t-4}^T)], \\ &= \tfrac{1}{2}\beta_2(R_{t-2}^T - R_{t-4}^T), \end{aligned}$$

in terms of the notation described in Part I. Using the values of the parameters in equation (7) for a 3 month multiplier time period we have

$$0_t = 1{\cdot}368\,0_{t-1} - 0{\cdot}658\,0_{t-2} + 0{\cdot}412\,0_{t-3} - 0{\cdot}412\,0_{t-4} - 0{\cdot}283\,0_{t-5} + 0{\cdot}283\,0_{t-6} + A_t. \quad (9)$$

Equation (9) yields a stable cycle with a unit periodicity of 12·5 or 37½ months. The cycle is only just within the limits of stability, deviations at successive peaks showing a decline of 11%. For a 3½ month period the model is easily stable with a calendar periodicity of 42 months. For a 2½ month period the calendar length is 32½ months and the cycle is explosive with deviations at successive peaks rising by 70%. With β_2 modified for the period 1924/28 the length of the cycle for a 3 month unit

[1]The assumption could also apply in the Trade sector and a model involving a 2 period distributed lag has been investigated. Whilst it reveals a plausible periodicity and stability it seems to involve a stock-sales lag which is excessively long and has, therefore, not been presented in the text.

period is 36 months and deviations at successive peaks show a decline of about 50%.

An alternative version of this model involves a 3 period distributed lag for the desired change in manufacturers' inventories. In this case we have

$$P_t^M = \tfrac{1}{3}\beta_2(R_{t-1}^T - R_{t-4}^T).$$

The lag in the operation of this model has been reduced by one period to ensure rough consistency with the observed lag in manufacturers' stocks behind their sales. For a 3 month unit period we now have a 6th order equation.

$$0_t = 1{\cdot}368 \ \ 0_{t-1} - 0{\cdot}383 \ \ 0_{t-2} - 0{\cdot}275 \ \ 0_{t-3} - 0{\cdot}189 \ \ 0_{t-5} + 0{\cdot}189 \ 0_{t-6} + A_t. \qquad (10)$$

Equation (10) gives a cycle of 12 periods or 36 months. A test sequence covering 3 complete cycles suggests that the model is on the borderline of stability, but the Routh-Samuelson test indicates that it is actually unstable. For a unit period of 2½ months the model is explosive with a period of approximately 30 months. For a 3½ month period it is stable with a length of 39 months. For the values of the sub-period 1924/28 and a 3 month period the cycle is stable with a length of 33 months, deviations at successive peaks showing a 50% fall.

We have, therefore, several models which, with the parameters of the period 1920/29 or the sub-period 1924/28, display non-explosive cycles with a length in close agreement with the observed length of the short cycles of the 1920's, provided that the multiplier time period can be taken as in the region of 3 to 3½ months. It is not necessary to select any of the 3 models as " the " model of the inventory cycle, since the three models give similar results on the matter of periodicity and stability. The similarity of results suggests that further modification of the model could still produce acceptable behaviour provided the average stock-sales lags were not substantially altered.[1]

[1]This is confirmed by several alternative models which have been investigated. The model involving a distributed lag in the trade sector, referred to above, gave, for a 3 month unit period, a stable cycle of 42 months. A model involving a distributed lag in the consumption of manufactured goods gave a stable cycle of some 39-42 months. Finally, a model involving a 3 period distributed lag in the consumption of services, the average lag being 1 unit period, gave results almost identical with those of the model in equation (7).

The three models show approximately correct lags between turning points in manufacturers' inventories and sales, 2 periods in the case of equations (7) and (10), 3 periods in the case of (9). The correct manufacturing stock-sales lag has been contrived by construction of the model. It is necessary to check that the lag thrown up in the trade sector is of acceptable length. Since the increase in stocks in period t equals the difference between deliveries and sales measured in the same set of prices we have Increase in Trade Stocks (t)

$$= - [a_2 0_t - a_2(2 + \beta_3)\, 0_{t-1} + a_2(1 + \beta_3)\, 0_{t-2}]$$
$$= - a_2 [\triangle 0_t - (1 + \beta_3) \triangle 0_{t-1}],$$

where $\triangle 0_t = 0_t - 0_{t-1}$. It is obvious that stocks must lag behind output at turning points, but the precise length of the lag can only be determined from actual sequences of behaviour. These indicate that the lag is from 1 to 2 periods, usually 2, for models with a 3 month unit period, though equation (7) (1924/28) gives a lag of 1 period. The length of the lag tends to be shorter in models involving a 3½ month period. These results do not seem inconsistent with the rather meagre data on actual lags in the trade sector. Using annual data Abramovitz found an average lag of 6 months for the period 1919/38.[1] Foss and Holmes speak of a lag of " a number of months "[2] in connection with the retail sector whilst Mack and Zarnowitz show an average lag of 2·3 months for undeflated department store sales and stocks for the period 1941/54.[3] The lag in the model sequences seems to be on the long side but it relates to the whole trade sector : the retail lag can be reduced by transfers from wholesale stocks and is probably shorter for undeflated data.

The models discussed so far have been based on the assumption that traders expect consumption in the following period to equal consumption in the current period. If they begin to base their orders on current trends in consumption then as Metzler has shown,[4] the amplitude of the inventory cycles is increased. It is clear that the explicit introduction of Metzler's " coefficient of

[1]*Inventories and Business Cycles*, p. 104, data in 1929 prices. For data in current values the lag was 3·8 months.

[2]*Survey of Current Business*, April 1951, p. 21.

[3]R. Mack and D. Zarnowitz, " Cause and Consequence of Changes in Retailers' Buying "—*American Economic Review*, March 1958, p. 26.

[4]*Review of Economics and Statistics*, February 1947, pp. 8-9.

expectations " into the models discussed would produce explosive models even for relatively small values of the coefficient. This potential explosiveness of the U.S. inventory cycle is an interesting and dangerous feature. Nevertheless, as far as the 1920's are concerned, it seems necessary to seek a model which allows for the factor of expected change in a plausible manner whilst retaining a non-explosive cycle.

It is interesting to note that Miss Mack's researches seem to indicate a certain cautiousness on the part of retailers in allowing for rates of change of sales in their forecasts. Referring to the boot and shoe industry she says :—

" . . . . it is the level of past sales that is projected with, in effect, some sort of seasonal adjustment. I have found no indication that the rates of change are projected over the period of the forecast."[1]

It does seem implausible to suppose that traders will mechanically extrapolate rates of change in the recent past, even on the basis of 3 month averaging, in view of the likelihood of random variations in the level of sales.[2] On the other hand, it is equally implausible to suppose that, in a period of persistent upward trend, as in the 1920's, they will never cease to behave as if the current period represented the pinnacle of achievement.

It would be possible to make the traders' coefficient of expectations reflect the changes over a number of past periods, but this would make the difference equations impossibly large. An easy way of avoiding this problem, whilst retaining an expectation of growth seems to be to apply a simple growth coefficient to the current (*i.e.*, expected) level of sales. Thus expected sales in period $t + 1$ equal $(1 + g)$ times actual sales in period t. The coefficient g can be assumed to be determined by experience over a number of preceding periods without involving these explicitly. This procedure is only valid for a period like the 1920's ; as we shall see later, in the face of a serious decline in sales as in the early 1930's the whole basis of the model needs revision. In the

[1]*Consumption and Business Fluctuations*, p. 101. See also Mack and Zarnowitz, *op. cit.* p. 31 n. 14.

[2]In practice the reversal of the unplanned change in inventories will ensure that random changes in sales do not seriously disturb desired levels of stocks. This, perhaps, supports the case for not extrapolating trends.

event of a minor recession of the type produced by the inventory cycle itself the growth coefficient implies that traders expect sales in the next period to have the same absolute deviation from the trend level as in the current period. Since the average growth rate for the whole economy is unlikely to exceed 1—2% per quarterly period the introduction of the growth factor can be seen to be of small importance. It does, however, eliminate the absurdity of traders assuming no growth of sales in a constantly growing economy.

It is not proposed to modify all the empirical difference equations already presented to allow for the expected growth factor since their general behaviour is unlikely to be affected materially by the change. This presumption can be checked by the following argument. It will easily be verified that the introduction of the growth trend into traders' expectations causes the basic equations to be modified to become

$$P_t^T = \alpha_2[\lambda+(1+g)\,(1+\beta_1)]\,0_{t-1} - \alpha_2(1+g)\,(\lambda+\beta_1)\,0_{t-2}$$
$$R_t^T = \alpha_2[(2+g) + \beta_3(1+g)]\,0_{t-1} - \alpha_2(1+g)\,(1+\beta_3)\,0_{t-2}.$$

The net effect of the change is that the coefficient α_2 is raised, approximately, by a factor of $(1 + g)$ and that this factor is not compounded. The significance of the second point can be seen if the logical step is now taken of recasting the whole model in a context of growth. Using the technique developed by Professor Hicks[1] we may interpret the terms 0_t, 0_{t-1} in the basic difference equations not as deviations from a basic equilibrium value but as deviations relative to the trend equilibrium value E_t, where $E_t = Eo\ (1 + g)^t$ and Eo is the equilibrium value at the base date. The form of the basic difference equations will now be as follows :—

$$0_t^\star = \frac{b_1}{1+g}\,0_{t-1}^\star + \frac{b_2}{(1+g)^2}\,0_{t-2}^\star + \ldots + \frac{b_n}{(1+g)^n}\,0_{t-n}^\star,$$

where $0_t^\star$ is the relative deviation from the trend equilibrium value in period t, *i.e.*, $\dfrac{0_t - E_t}{E_t}$, and the b's are combinations of the α's and β's appropriate for the particular model. Since the growth factor $(1 + g)$ now appears in the denominator and is compounded it is evident, by analogy with the case of the 2nd order difference

[1] J. R. Hicks, *A Contribution to the Theory of the Trade Cycle*, p. 87.

equation,[1] that the introduction of traders' expectations in the form considered merely reduces slightly the degree of instability of the models and increases slightly the length of the cycle through the effective increase of a_2. This inference has been checked by reworking the model given in equation (7) for an expected growth of 5% per annum. This gives a modified equation.

$$0^*_t = 1{\cdot}364 \; 0^*_{t-1} - 0{\cdot}650 \; 0^*_{t-2} + 0{\cdot}801 \; 0^*_{t-3} - 1{\cdot}338 \; 0^*_{t-4} + 0{\cdot}540 \; 0^*_{t-5}. \tag{7a}$$

A test sequence suggests that the periodicity is unchanged at 13 units or 3¼ years for a 3 month unit period and that the model is now just about on the point of stability. The Routh-Samuelson test, however, indicates instability, evidently by a narrow margin. It seems fair to presume that a reworking of equation (8) for the sub-period 1924/28 to allow for expected growth would leave the periodicity unchanged and produce a further gain in stability.

We may conclude that it is possible to construct models of the structural inventory cycle which display a periodicity in calendar time in close agreement with that of the observed short cycles of the 1920's. The inventory-sales lags of the models, at the turning points, seem broadly consistent with the observed lags and, given the change in the marginal inventory-sales ratio in the manufacturing sector after 1923, the models are non-explosive as seems to be required by the facts. The broad consistency of the models with the observed cycles does not, of course, "prove" that the short cycles of the 1920's were caused by this mechanism; but proponents of alternative theories will presumably have to explain away the potential results of the interaction of the consumption function and the inventory accelerator. It may be of interest at this stage to comment briefly on the behaviour of other aspects of capital formation in the 1920's.

The main explanation of the great boom of the 1920's and the depth of depression in the 1930's is undoubtedly to be found in the operation of the long cycle in residential building. This cycle, of some 18 years period between peaks, which dominates the history of U.S. business fluctuations in the period before 1913, had reached a peak in 1909/10 and was moving into its depression phase before the first world war. The decline in residential

[1]See Hicks, *op. cit.*

construction during the war, together with continued growth in the number of families provided the basis for a postwar boom in residential building which was accentuated by the effects of the massive innovation of the motor car. Thus the boom of the 1920's presented the typical historical features of the U.S. business cycle boom, the interaction of transport innovation and the residential building cycle.[1] In retrospect it seems clear that the origins of the slump in the 1930's lay in the turning point of expenditures on residential construction in 1926. Having increased from \$1·4 billn. (1929 Prices) in 1920 to \$4·8 billn. in 1925 and 1926 they had declined by 1929 to \$3·7 billn. This decline in real expenditures on residential construction after 1926 was offset partly by increases in public and other private construction so that aggregate expenditures on construction fell only by \$0·4 billn. from 1926 to 1929[2]. The smooth behaviour of this core of gross capital formation in the 1920's is the main justification for the casual treatment of autonomous investment in the previous discussion of the models of the inventory cycle. The behaviour of aggregate expenditures on producers' durable goods was less regular. This series shows reductions in 1921, 1924, and 1927 and these declines provide an obvious source for alternative explanations of the short recessions of the 1920's. These temporary declines in expenditures on producers' durables were, however, much less important than the changes in inventory investment as can be seen from the following figures.[3]

	Decline in Inventory Investment (*Manufacturing and Trade*) \$ *billn.* (1929 *prices*)	*Decline in Producers' Durables* \$ *billn.* (1929 *prices*)
1920/21	— 2·8	— 1·7
1923/24	— 2·9	— 0·4
1926/27	— 1·3	— 0·4

There seems to be a case for regarding the change in the rate of inventory investment as the dominating force behind the minor

[1]*Cf.* N. Silberling, *The Dynamics of Business*; B. Thomas, *Migration and Economic Growth*; W. Isard, " A Neglected Cycle: the Transport Building Cycle " *Review of Economics and Statistics*, 1942.

[2]Data from Kuznets, *National Product since* 1869, p. 41.

[3]Source: Kuznets, *op. cit.* pp. 36, 46.

recessions. Acceptance of this proposition, however, need not involve acceptance of the proposition that the course of inventory investment was determined by the mechanism of the structural inventory cycle. In spite of the favourable result of the periodicity and stability tests it must be admitted that the behaviour of the inventory and sales series in the 1920's is not altogether consistent with the requirements of the theoretical cycle. In the 1923/24 and 1926/27 recessions Abramovitz' data show negative inventory investment in the trade sector despite the fact that real consumption of manufactured goods increased by about 3% in each case according to the yearly figures of Kuznets. Also in the recession of 1926/27 inventories in the manufacturing sector were reduced from year-end 1926 to year-end 1927 despite a small increase in annual sales in current and, presumably, in real values.[1] A decline in the rate of increase of inventories would be more plausible. The discrepancy can be explained away, if desired, in several ways, e.g., inaccurate measurement, the ambiguity created by yearly and year-end data, and the possible existence of unplanned increases and decreases of inventory. The Department of Commerce quarterly data on manufacturers' inventories and sales do not record any significant cyclical recession of sales from 1926/27 though inventories in current values show some decline in the first half of 1927. It seems impossible to exclude the theory that the 1926/27 recession, at least, resulted from some *ad hoc* decision by businessmen that inventory accumulation had temporarily gone far enough. A final verdict on the role of the structural inventory cycle during this period cannot be given until adequate deflated quarterly data is available for the main variables.

The role of inventory investment in the case of the 1929 turning point was different. Here the decline in producers' durables from 1929 to 1930 was \$1·4 billn. whilst the change in inventory investment (manufacturing and trade) was —\$1·5 billn. Construction expenditures also fell by \$1·6 billn. whereas they had increased, even if slightly, in each of the recessions of the 1920's.[2] In this case inventory factors cannot claim primacy in terms of changes in sources of effective demand. Yet the

[1]*Cf.* Abramovitz, *op. cit.*., p. 568, Kuznets, *op. cit.*, p. 35.

[2]Kuznets, *op. cit.*, pp. 36, 41, 46.

inventory cycle may well have determined the timing of the recession of 1929/30. The F.R.B. index of manufacturing production (seasonally adjusted) shows a peak in July with Durables turning in August and Non-Durables steady from May to October. The individual series show clearly the existence of a turning point zone between April and October 1929. Given the assumption that the U.S. economy was vulnerable to depression because of the decline in residential construction or over-investment in industrial capital, or both, the question is why did business activity in general turn when it did rather than say 6 months earlier or later? Possible answers to this question are the shock effects of the Stock Market Crash and monetary policy but neither of these is very convincing. The break in the Stock Market came in September, well towards the end of the zone of turning points. The "signal effect" of monetary policy is an inadequate explanation if only on account of the fewness of signals. Rediscount rates at the Federal Reserve Banks were raised generally from 3½ to 5% in 3 stages in 1928. From July 1928 until August 1929 there was no further increase in rates except that in May the 3 Reserve Banks which had not raised their rates to 5% in 1928 came into line. In August the New York Federal Reserve Bank alone raised its rate to 6%. Apart from these events the only other major act of monetary policy was the warning delivered in February by the Board that commercial banks making loans to the Stock Exchange should not depend on the Federal Reserve for accommodation. This sequence of events in monetary policy can doubtless be held to explain the timing of the turning point zone in 1929 but the argument seems to require hypersensitive reactions of businessmen to monetary policy. It is difficult to resist the attractions of the alternative theory presented by the structural inventory cycle which can explain the general similarity of the trends in the individual manufacturing sectors in terms of the common basic relations of the marginal propensity to consume and the inventory-sales ratio. There is no reason to preclude an interaction between the inventory cycle and events in the Stock Market and monetary policy. The boom in producers' durables in 1928 may have been grounded in false optimism aroused by the Stock Exchange boom and could provide the exciting factor generating the final

upswing and inevitable downturn of the inventory cycle. Similarly the events of August and September 1929 could have added impetus to a downswing which was otherwise inevitable.

III

The period from 1929 to 1937 in the U.S.A. is noteworthy for the absence of the minor cycle which is typical of other peacetime periods. It is generally accepted that the period from 1929 to 1937 forms a continuous cycle measured from peak to peak, the National Bureau dates for turning points being June 1929 and May 1937 with the intervening trough in May 1933.[1] The absence of the normal minor cycle from this period merits an explanation from the business cycle theorist and proponents of the structural inventory cycle as an explanation of the short cycles of the 1920's and other periods have an obligation to explain the disappearance of the inventory cycle during the early and middle 1930's. The following sections will attempt to provide such explanations in terms of changes in the parameters and structure of the basic model. It is not surprising that a period which saw a decline in the volume of basic investment in construction and producers' durable equipment of some 70% (1929 to 1933) should witness also changes in the marginal propensity to consume and in the inventory-sales policies of businessmen. Perhaps a perfectly general theory of the inventory cycle should be capable of explaining such changes in terms of its general structure. For the present, partly through ignorance and partly from the desire for simplicity we are compelled to take these changes as exogenous to the model.[2]

The argument is also based on the assumption that the main outlines of the decline and subsequent recovery in the 1930's can be explained primarily in terms of the behaviour of the long cycle

[1] *Historical Statistics of the U.S.A.*, p. 320, Table I.

[2] The change in the marginal propensity to consume to a lower value for the period 1929 to 1933 can of course follow automatically if a consumption function of the Duesenberry-Modigliani type is used. These functions are normally presented in terms of a relationship between consumption and disposable income but they could be interpreted in terms of a consumption—G.N.P. relation. This has not been attempted in this article because the difference equations are already difficult enough to handle. Also for most of the period considered there would be little gain from use of a modified consumption function.

in residential construction which sets the pattern of autonomous investment. The discussion covers 3 sub-periods 1929/32, 1932/35, and 1935/37 the dating being determined by the inventory-sales behaviour of businessmen.

For the period 1929/32 the marginal propensity to consume manufactures fell from the value 0·46 in the 1920's to a value of 0·28. The marginal propensity to consume services fell from 0·25 to 0·15[1]. The inventory-sales ratios in trade and manufacturing deviate in opposite directions from their regression line values for the 1920's. For the period 1929/32 the values of β_1 and β_2 become 1·16 and 0·43 respectively for a multiplier period of 3 months.[2] If these values are inserted into equation (6) we have the empirical equation

$$0_t = 0{\cdot}94\ 0_{t-1} - 0{\cdot}51\ 0_{t-2} + 0{\cdot}46\ 0_{t-3} - 0{\cdot}80\ 0_{t-4} + 0{\cdot}34\ 0_{t-5} + A_t. \qquad (11)$$

A test sequence of this equation shows a cycle of periodicity approximately 2 years, which is substantially damped, the deviations from the equilibrium value declining by 49% at the second and 64% at the third peak. In view of the possible importance of random factors in a heavily damped model it would be unwise to take the results of equation (11) too seriously. But it is interesting that it predicts the existence of a minor peak in the downswing from 1929 to 1932, which, if the model is valid, should be located in the middle of 1931. In fact there is some evidence of a minor peak in the second quarter of 1931. The F.R.B. index of manufacturing production (seasonally adjusted) shows 2 checks to the rapid decline from its peak value in July 1929 of 61 (1947/9 = 100) to a trough of 27 in July 1932. The first, and less important, check occurs in January 1930, when the index rises 1 point above the December 1929 level and maintains the December level until April 1930. The second check occurs in February 1931 when the index rises 1 point above the level for December 1930 and January 1931 and maintains a level of 42 until May 1931, then resuming its decline. The second check shows up more prominently in the index of non-durable manufactures

[1]Both values derived from the incremental change in the Kuznets data. The value for services is adjusted to exclude direct taxes and imputed rents as described before.

[2]These are incremental changes derived from the series as described in the Appendix to part I.

where the index rises from 48 in January 1931 to 50 in April and maintains that level until July. The July level is some 11% higher than a crudely fitted trend value between the 1929 and 1932 turning points. Evidence of a minor peak in 1931 is also to be found in quarterly data for manufacturers' sales and inventories and consumers' expenditure, all in real terms. Sales for the second quarter were 5% higher than in the first quarter of 1931. Inventories in the first quarter of 1932 show a small increase (1·3%) over the previous quarter, the lag here being longer than the average. Consumers' expenditure exhibits its minor peak in the first quarter of 1931.[1] Thus the evidence is consistent with the existence of a weak inventory cycle superimposed on the major downswing. The check in 1931 can hardly be attributed to factors in long term investment since Kuznets' data for construction and producers' durables indicate a fall of $3·6 billn. (1929 prices) in 1931 as compared with $3 billn. in 1930. Moreover the check is less evident in durable manufactures than in non-durables.[2]

In the upswing of the 1930's the marginal propensity to consume manufactures returned substantially to the value of the 1920's, the value of a_2 on Kuznets' data being approximately 0·43. For services the coefficient a_1, as calculated previously, takes a value of 0·17. The behaviour of business inventories is somewhat obscure during the period 1932/35. According to Abramovitz total inventories in trade and manufacturing (1929) prices) declined from $24·5 billn. at year-end 1932 to $22·2 billn. at year-end 1933 and thereafter until year-end 1935 remained more or less constant in volume.[3] If, however, his current totals are deflated by the B.L.S. wholesale price index number for the last quarter the total inventory decline from 1932 to 1933 is reduced from $2·3 billn. to $0·5 billn. From 1933 to 1935

[1]Sales and Inventories from Department of Commerce data in current values deflated by the B.L.S. wholesale price index (all commodities). Consumers' expenditure read from Figs. 1 and 2 in Metzler, " Three lags in the Circular Flow of Income ", *Essays in Honour of Alvin Hansen*, pp. 23-4.

[2]The checks in the decline of production in 1930 and 1931 were each associated with a check in the decline in the index of share prices. This provides an alternative theory of the checks if a causal link can be demonstrated and if an independent explanation of the stock market rallies can be provided.

[3]Abramovitz, *op. cit.*, p. 567.

there is a further small decline of \$0·7 billn. Since total consumption of manufactures and producers' durables showed little change from 1932 to 1933 whilst production of manufactures increased by 20%. there seems to be a case for preferring the lower estimate of the inventory decline from 1932 to 1933 since the turning point in production could then be explained in terms of a substantial check to the rate of liquidation of inventories. However, it seems that from end-1933 to end-1935 businessmen were tolerating some unplanned decline in the level of total inventories or at the most conserving them at a roughly constant level. On the basis of the latter hypothesis the inventory cycle model for this period can be reduced to a very simple case represented by the equation

$$0_t = [a_1+a_2\,(1+\lambda)]\,0_{t-1} - a_2\lambda\,0_{t-2} + A_t.\text{ [1]} \qquad (12)$$

For the observed values of a_1 and a_2 this equation yields a cycle of $10\frac{1}{2}$ to 11 periods. The length of this cycle is, however, unimportant because the degree of damping given by the value of $a_2.\lambda$ (= 0·28) is so great that the cycle would be obliterated by the random variations in consumption and investment which are bound to occur in practice. It is, therefore, not surprising that the period from end-1933 to end-1935 should exhibit no trace of the typical short cycle of the 1920's. The general upward trend of manufacturing production is indeed disturbed by minor recessions as from April to September 1934 and March to July 1935, but these are too small and brief to warrant analysis. The same cannot be said of the short but spectacular cycle of 1933 which preceded this quiescent period. From a trough in March 1933 to a peak in July 1933 the index of manufacturing production rose by no less than 67% afterwards declining by 20% to December 1933. A non-seasonal swing of such magnitude calls for some discussion.

The trough of March 1933 seems easily explained by the effects of the Bank Holiday of 1933, the end of the period of political uncertainty and banking crisis associated with the presidential interregnum which interrupted the normal recovery from the trough in 1932. What is surprising is not the recovery

[1] Traders' orders for delivery in period t being simply the sum of estimated sales ($a_2\,0_{t-1}$) plus the reversal of the unplanned change in stocks at cost ($\lambda[a_2 0_{t-1} - a_2 0_{t-2}]$).

from the Bank Holiday of 1933 but the enormous amplitude of recovery and its abrupt reversal in July. Several factors may be brought in to explain this reversal. It has been suggested that the minor boom was a speculative movement based on expectations of the results of the National Industrial Recovery Act of June 1933. The Act was expected to lead to increases in prices and labour costs, therefore businessmen attempted to increase production in advance of the increase in labour costs in order to profit from the expected price increases.[1] Inventory accumulation of a speculative nature seems to have been confined to the trade sector since the Department of Commerce data show a slight fall in manufacturers' inventories between the first and second quarter-ends of 1933 whilst manufacturers' sales rose from $7 billn. in the first quarter to $8·5 billn. in the second quarter and $10 billn. in the third quarter.[2]

The behaviour of the trade sector can only be judged by series relating to department store sales and stocks, which may not be typical. The F.R.B. index of department store sales seasonally adjusted shows an increase of 10% from the first to second quarters of 1933 and 7% from the second to third quarters. The F.R.B. index of department store stocks, seasonally adjusted, shows an increase of 5% from end-March to end-June with a further 20% increase by September.[3] Manufacturers' inventories also increased by $600 milln. or 9% during the third quarter, though this may reflect unplanned changes. Assuming some lag between deliveries and orders/production the hypothesis of a short period of speculative inventory accumulation seems reasonable. The ending of planned accumulation following the increase in labour costs after July would automatically produce a decline in production. A secondary factor behind the short boom was the increase in exports, the seasonally adjusted monthly rate

[1]See A. R. Burns, *The Decline of Competition*, pp. 515-16 ; H. W. Arndt, *Economic Lessons of the Nineteen-Thirties*, pp. 44-5.

[2]Seasonally adjusted undeflated data supplied by the Department of Commerce.

[3]This increase has been explained as " reflecting in part a response to sales increases and in part the anticipation by store managers of higher prices in connection with the N.R.A. program." See R. Youngdahl and J. O. Bergelin, " Revised Index of Department Store Stocks," *Federal Reserve Bulletin*, June 1946, p. 589.

increasing by about 50% from March to July 1933.[1] This coincided with a depreciation of the dollar of 28%[2] though export prices do not seem to have declined in terms of foreign exchange.[3] A possible factor explaining the timing of the minor peak in July 1933 is the effect of President Roosevelt's letter of July 3rd to the World Economic Conference in which he refused to agree to the stabilisation of the dollar. This may have played an important part in ending the conference without results and producing a mood of uncertainty and pessimism.[4]

From 1935 there appears to have been a definite change in the inventory-sales policy of businessmen. In the trade sector the marginal inventory-sales ratio of the 1920's was re-established from 1935 to 1942 though the absolute level of inventories fell short by several billion dollars of the figure predicted by the 1920's regression line. In the manufacturing sector there was a rapid return to levels consistent with the regression line for the 1920's ; in consequence the marginal inventory-sales ratio over the short period attained an extremely high value, the incremental ratio for 1935/36, being twice the average for the period 1920/38.[5] From 1937 to 1941 the marginal ratio was probably substantially the same as the value for the period 1920/38.[6]

It is not possible to make a full test of the inventory cycle model in relation to events between 1935 and 1937. If the revealed inventory-sales ratio in manufacturing is treated as a true behaviour relation the model produces a completely unstable cycle, so that the 30% rise in manufacturing production between 1935 and 1937 and the fairly rapid reversal of the inventory boom in mid-1937 are easily explained. However, it could be argued

[1]The increase at an annual rate being about $650 milln. *Historical Statistics of U.S.A.* p. 340.

[2]R. G. Hawtrey, *The Gold Standard in Theory and Practice*, p. 163.

[3]*Cf.* P. T. Ellsworth, *The International Economy*. p. 534.

[4]*Cf.* H. Hoover, *The Memoirs of Herbert Hoover*, pp. 363–68, W. A. Lewis. *Economic Survey* 1919–1939. p. 68, For a contrary opinion see A. H. Abbati, *Economic Readjustment in* 1933, pp. 77–82.

[5]For 1935/37 the incremental ratio is even higher, possibly because the end year figure for inventories in 1937 was unduly raised by the sharp decline in sales in the 4th quarter. For the annual figures sales are, as before, Shaws' output of finished commodities adjusted for the change in manufacturers' inventories.

[6]This statement is based on the behaviour of the Department of Commerce series 1929/41 in conjunction with the Abramovitz/Shaw data for 1920/38.

more plausibly that the boom resulted from the attempts of manufacturing business to re-establish the " normal " relationship between inventories and sales after a period of uncertainty in which the level of inventories had been allowed to fall relative to sales. In this case the inventory boom could last beyond the limit dictated by the model based on 1935/37 parameters since a level of inventories in excess of the desired level relative to the model could still fall below the desired level relative to the " normal " inventory-sales relation. There is the further point that the change in the marginal inventory-sales ratio in manufacturing after 1937 means that the model based on 1935/37 parameters is valid only for the first upswing. The duration of this would depend heavily on the timing of the autonomous attempts to raise inventories in the manufacturing sector together with any other random disturbances. Thus the theoretical model cannot provide a reliable estimate of the expected length of the 1935/37 upswing. Nevertheless, the model does predict an upper turning point and, if it is assumed that manufacturers' inventories had regained their normal level relative to sales by the end of 1936[1] the upper turning point could be expected within a few unit periods of that date. Since an explosive model is also consistent with the extremely vigorous nature of the boom there is a *prima facie* case for regarding the structural inventory cycle as a major causal factor in producing the 1937/38 recession. This statement is in conflict with the conclusions of Mr. K. D. Roose's detailed study of the 1937/38 recession[2], consequently a brief discussion of the question is in order.

Mr. Roose is inclined to play down the role of the inventory factor in the recession. He argues :—

" The most reasonable assumption about the relationship of inventories to the recession appears to be that a considerable part of the inventory change was unplanned investment. It resulted when income, expenditures, and production began to decline and when expectations about business conditions failed to be realised. Seen in its proper light, inventory change was an intensifying rather than a causal factor in the recession. Inventory

[1]The 1936 observation is approximately centred on the regression line for the period 1920/38.

[2]K. D. Roose, *The Economics of Recession and Revival : An Interpretation of* 1937/38.

change, however, was probably of some significance in the revival because the reduction of stocks undoubtedly was regarded by businessmen as an encouraging development.[1]

In his view the major causal factors behind the recession were (1) the drastic reduction in the net government contribution to income in January 1937, (2) the effects of the Federal Reserve action to increase reserve requirements together with the undistributed profits tax on the availability and cost of capital, and on expectations, and (3) the reduced profitability of investment beginning in the first quarter of 1937. The third factor is rated as the most important.[2]

With Roose's view on the importance of government fiscal action there can be no dispute—some comment on this factor will be made presently—but skepticism must be registered concerning the influence of his second and third factors assuming them to operate via the rate of fixed capital formation. Without disputing their relevance it could be argued, reversing his approach, that they were merely intensifying rather than causal factors in the recession. The justification for this statement, apart from that which is implicit in the preceding discussion of the structural inventory cycle, lies in the order of magnitude of the relative changes in effective demand between 1935 and 1938 which were occasioned by inventory and fixed investment. Using the Department of Commerce G.N.P. data the changes are shown in the following table.

Year to Year Changes in Components of G.N.P. in constant (1954) prices. ($billn)[3]

	Producers' Durable Equipment	Construction	Govt. Purchase of Goods and Services	Non-Farm Inventory Change
1935/36 ...	+2·5	+2·7	+3·9	+3·4
1936/37 ...	+1·3	+1·9	−0·9	−0·9
1937/38 ...	−3·2	−1·2	+2·8	−5·7

[1] *Op. cit.* p. 191.
[2] *Op. cit.* pp. 238–39.
[3] Data from *Survey of Current Business*, July 1958, pp. 10–11. The use of Kuznets' data from *National Product since* 1869 would not materially alter the picture.

The table shows that whilst there was, admittedly, some deceleration of the growth of fixed capital formation from 1936 to 1937 there was an absolute decline in the level of government expenditure and in the change in inventory investment. The last 2 components of effective demand may therefore be regarded as approximately equal primary factors behind the recession. If some part of inventory accumulation in 1937 was unplanned the active role of inventories is strengthened. Following the actual turning point in 1937, however, it becomes possible to give greater weight to the influence of fixed capital formation as the causal factor, though part of the decline may have been induced by the inventory recession, whilst government expenditure clearly acted as a stabilising factor.

Following 1937 there seems to have been reasonable stability of the various parameters of the inventory cycle model and testing again becomes feasible. For the period 1937/41 the model yields the following empirical difference equation[1] for a 3 month unit period

$$0_t = 1{\cdot}215\ 0_{t-1} - 0{\cdot}615\ 0_{t-2} + 0{\cdot}771\ 0_{t-3} - 1{\cdot}301\ 0_{t-4} + 0{\cdot}530\ 0_{t-5} + A_t \qquad (13)$$

This equation gives a stable cycle of about 3 years with deviations at successive peaks declining by about 14%. If the same model is fitted with parameters based on Department of Commerce G.N.P. data the result is a shorter cycle of about 33 months with deviations at successive peaks declining by about 35%[2]. The short recession of 1938 and the recovery in 1939 seem roughly consistent with a theoretical cycle of this length though it might be argued that the recession was shorter than the model would imply. The index of manufacturing production gives a peak in May 1937 but the decline was relatively small until the last quarter of 1937. By January 1938 the decline was virtually complete even if the actual trough must be placed as late as June 1938.

[1]Using $\alpha_1 = 0{\cdot}17$ $\alpha_2 = 0{\cdot}43$, $\beta_1 = 0{\cdot}78$, $\beta_2 = 0{\cdot}56$, $\lambda = 0{\cdot}65$.

[2]The shorter cycle results mainly from the lower estimate of α_1 at 0·10 on Department of Commerce data. The value of α_2 is virtually identical at 0·44, whilst β_1 becomes 0·65. The coefficients β_2 and λ have been left unchanged. The test sequence shows a tendency towards double peaks with an interval of 2 unit periods.

Two possible explanations of the rapid check to the downswing may be offered. The Department of Commerce data indicates a marked fall in the marginal propensity to consume manufactures from 1937 to 1938, the decline in G.N.P. of $8·4 billn. (1954 prices) being accompanied by a fall of only $1·4 billn. in personal expenditures on goods. The small decline in consumption cannot be explained in terms of divergent falls in G.N.P. and disposable incomes since the fall in current disposable income of $5·3 billn. was almost equal to the fall in current G.N.P. of $5·6 billn.[1]

The Kuznets figures do not display the same fall in the marginal propensity to consume manufactures, but this is because the change in G.N.P. from 1937 to 1938 is affected by his residual estimate of consumption of services which shows an increase of $2 billn. (1929 prices) from 1937 to 1938, a rather implausible change. Using his alternative estimate of services the pattern of the Department of Commerce series is confirmed.[2] Secondly, the effects of government fiscal policy must have played a part in checking both the boom in 1937 and the slump in 1938. In 1937 total Government purchases in current dollars were 11·7 billn. compared with 11·8 billn. in 1936, a decline in real terms. Tax collections less transfers rose, however, from 8·9 to 12·2 billn.[3] It seems fair to regard a substantial part of the increase in taxes as autonomous.[4] In 1938 taxes less transfers declined to $11·3 billn. whilst Government purchases increased to $12·8 billn. a substantial increase in real terms.[5] It has been suggested that the mere announcement of a new programme of expenditure on relief and public works in 1938 caused recovery on the Stock market[6] and such a change in confidence may be assumed to have influenced current production policy.

[1]Data from *Survey of Current Business*, July 1958, pp. 6, 10. The decline in disposable income in 1954 values would be about $7·6 billn.

[2]*Cf.* Kuznets, *op. cit.*, pp. 34, 35, 52.

[3]E. Cary Brown, "Fiscal Policy in the Thirties: A Reappraisal", *American Economic Review*, December, 1956, p. 864. *Survey of Current Business*, July 1958, pp. 4, 10–11.

[4]Social security contributions increased by $1·2 billn. Estate and gift taxes by $0·6 billn. Transfer payments declined by $1·2 billn. Data from *National Income*, 1954. Table 8, p. 170 and Table 9, p. 172.

[5]Brown, *op. cit.*, *Survey of Current Business*, July, 1958. pp. 10–11.

[6]H. W. Arndt. *The Economic Lessons of the Nineteen-Thirties*, p. 69.

There does not seem to be much point in discussing the behaviour of the inventory cycle model in the context of events after 1939. However, the approximate stability of the various parameters of the model as far as 1940 does suggest that there should have been another inventory recession beginning late 1939 or in 1940. The index of manufacturing production shows a rise from July 1938 to December 1939 (with a temporary check in April and May). From December 1939 to April 1940 there was a decline of 10% followed by continuous increase to 1943. The decline of production in 1940 may be regarded simply as a natural reaction from the temporary burst of precautionary and speculative buying and inventory accumulation which followed the outbreak of war in September 1939 and therefore unrelated to any structural inventory cycle. But production was rising before September 1939 and the 16% increase from August to December may be regarded as a speeding up of the final stages of the inventory upswing under the influence of speculative and expectational factors. Thus the decline in production from January to April 1940 could have been the beginning of an inventory recession of the 1938 pattern.[1] The failure of this potential recession to materialise is easily explained by the trend of events in 1940. The reversal of the trend of production in 1940 does not appear to have been strongly influenced by the trend in exports, as might have been thought. The monthly average of semi-manufactured and finished manufactured exports (current values) rose by 21% from September/December 1939 to the first half of 1940 and showed only a 5% further rise in the second half of 1940.[2] The influence of export demand on industrial production may have been substantially greater than the direct figures would suggest because of the heavy concentration on armaments. It has been suggested that there was little unused capacity in these

[1]*Cf. Survey of Current Business*, Feb. 1941, p. 8. " Although further liquidation [of inventories] would probably have occurred if the comparatively inactive phase of the war had continued, trade comment at the time indicated the likelihood that, as long as a state of war existed in Europe, stocks would be held somewhere above mid-1939 levels."

[2]Data from *Survey of Current Business*, February 1940, p. 75 and February 1941, p. 83. The quantity indexes have not been used because of the pronounced decline of exports of foodstuffs and crude materials during 1940.

industries at the time[1] so that increased orders involved an indirect demand for industrial plant and equipment. The expansion of purchasing by the Allied Commission, following the invasion of the Netherlands and France in May 1940 therefore becomes specially important in this context.[2] The major source of revival of production in 1940 seems to have been the change in attitude of the U.S. government following the German military successes in the second quarter of 1940 which led to the formulation of a massive defence programme. The actual increase in defence expenditures during 1940 was relatively small but it is clear that the size of the projected programme completely changed the business outlook.[3] As a result new orders of manufactures doubled in size between March and December 1940 whilst unfilled orders increased by a factor of three.[4]

IV

In testing the inventory cycle model for the post-war period it is unfortunately necessary to confine attention to the period since 1950. For the period 1946 to 1950 there is not enough stability in the main parameters of the model to justify the calculation of theoretical periodicities. This is particularly true of the marginal propensity to consume manufactures, whether measured in relation to G.N.P. or to real disposable income. Consumption of goods increased from 1946 to 1947 despite declines in G.N.P. and disposable income ; it increased again from 1948 to 1949 despite a decline in G.N.P. though disposable income increased in this case. The inventory-sales ratios were not so erratic in their behaviour. In the manufacturing sector the observations for 1947 to 1950 are broadly consistent with the regression line of 1929/42, but in the trade sector the years 1946/48 seem to have marked an attempt to raise the level of

[1]*Survey of Current Business*, Feb. 1941, p. 4.

[2]*Cf. Survey of Current Business*, Feb. 1941, pp. 4, 8.

[3]*Cf. Survey of Current Business*, Feb. 1941, p. 5. According to W. K. Hancock and M. M. Gowing " the President of the United States, between 16th May and 10th July, sent three special messages to Congress requesting defence appropriations totalling $7,100 million—a trivial sum in comparison with the appropriations that came afterwards, but more than three times the money that had been requested in the regular budget message of January 1940." *The British War Economy*, p. 196.

[4]*Survey of Current Business*, June 1952, p. 5. Table 1.

inventories from the relatively low level of the war years. The observations for 1948 and 1949 are consistent with the pre-war regression line. The arbitrary nature of consumption and inventory behaviour does not rule out inventory factors as an explanation of the 1949 recession on an *ad hoc* basis as can be seen by examination of the main changes in gross capital formation from 1948 to 1949. Expenditures on construction (in 1954 dollars) declined by 0·4 billn., producers' durables declined by 3·0 billn., whereas the change in inventory investment (non-farm) amounted to minus 5·6 billn. The relative importance of the inventory change is magnified if other autonomous expenditures are considered. The value of government purchases from business increased substantially from 1948 to 1949 whilst the value of exports of finished and semi-finished manufactures showed only a slight decline. If these items are roughly converted into 1954 values the volume increase from 1948 to 1949 was 4·6 billns. Thus, the total of autonomous expenditures directly affecting manufacturing production showed an increase from 1948 to 1949 of about \$1·2 billn. whereas the change in inventory investment was *minus* \$5·6 billn. Of course, the decline in inventory investment in 1949 may have been influenced by the decline in the rate of increase in these autonomous expenditures. The increase of \$1·2 billn. from 1948/49 compares with an increase on the same basis, of \$8·5 billn. from 1947/48[1]. But this deceleration does not explain why inventories should have fallen by \$2·6 billn. (1954 prices) in 1949 since real sales of manufactured goods to final consumers also increased from 1948 to 1949. The Department of Commerce analysis of the net change in business inventories by industrial group[2] shows that the major part of the decline in non-farm inventories in 1949 occurred in the manufacturing sector where inventories fell by \$1·5 billn. compared with only \$143 milln. in the trade sector, out of a total decline for non-farm inventories (net of inventory valuation

[1]Data used in this section are taken from *Survey of Current Business*, July 1958, Table 7, p. 11, *National Income* 1954, Table 9, p. 173, *Business Statistics* 1957, p. 106. The current expenditures on government goods and exports were deflated by the B.L.S. wholesale price index number, using the sector for finished goods (*Business Statistics*, 1957, p. 27).

[2]*National Income* 1954. Table 33, p. 211.

adjustment) of \$1·9 billn.[1] In terms of 1954 prices the decline in manufacturers' inventories would be about \$1·7 billn. This was considerably more than the fall warranted by the "normal" relationship between inventories and sales. Since the observation for 1948 lies above the pre-war regression line whilst that for 1949 lies on the line we may conclude that the recession of 1949 in manufacturing production can be explained by inventory factors on an *ad hoc* basis, the underlying causes being the deceleration of growth of autonomous expenditures in manufactured goods together with a correction by manufacturers of excessive inventory accumulation in 1948.

From 1951 conditions became more favourable for observation of a possible structural inventory cycle. The relationship between consumption and G.N.P. is quite stable both for manufactures and services. A line fitted to consumption of goods and G.N.P. for the years 1951 to 1957 gives a marginal propensity to consume manufactures of approximately 0·5, the mean deviation from the line being 0·7% and the maximum deviation (1954) 1·4%. In the case of services (net of imputed rents) the line fitted to the data for 1951/56 gives a marginal propensity to consume of about 0·22 with a mean deviation of 1·3% and a maximum (1954) of 2·6%[2]. The trade sector displays a fairly stable inventory-sales ratio over the period 1951/57, the observations on an annual basis conforming to a marginal ratio of 0·12 with a mean deviation of 0·8% and a maximum deviation (1957) of 1·5%. In the manufacturing sector the assumption of a stable inventory-sales ratio for this period is less warranted but reasons are given in the Appendix to part I for using the inter-war period value in testing the model.

Using values of the relevant parameters as indicated above[3] the basic model of the inventory cycle yields the following

[1]This is lower than the value given in the revised data (\$2·2 billn.) which forms the basis of the \$2·6 billn. decline in 1954 prices.

[2]Data from *Survey of Current Business*, July 1958, Table 7, p. 11. Services in 1954 prices were corrected for imputed rents by deducting current values of imputed rents from *Survey of Current Business*, July 1957, Table 30, p. 21 and *National* Income 1954, Table 30, p. 207 (for 1951) deflated by the B.L.S. rent index from *Business Statistics* 1957, p. 26.

[3]The coefficient λ was assumed to take the same value as in the period 1920/38. Small changes in this parameter are unlikely to have much effect on the periodicity of the model.

5th order difference equation for the period 1951/57, assuming a 3 month multiplier time period

$$0_t = 1{\cdot}29\ 0_{t-1} - 0{\cdot}57\ 0_{t-2} + 0{\cdot}77\ 0_{t-3} - 1{\cdot}26\ 0_{t-4} + 0{\cdot}49\ 0_{t-5} + A_t \tag{14}$$

The test sequence for this equation gives a cycle of approximately 13·5 periods, or 40 months with deviations at successive peaks declining by about 30%. For a period of 2·5 months the length is approximately 14 units or 35 months and the cycle is unstable with deviations at successive peaks increasing by about 12%. For a period of 3·5 months the cycle has 13 periods, about 45 months, and deviations at successive peaks decline by about 60%. As in previous cases the 2·5 and 3·5 month period models can be re-interpreted as 3 month models with appropriate changes in the inventory-sales ratios. The range of periods from 42 to 39 months shows, again, that periodicity is insensitive to substantial changes in, or errors in the estimation of, these parameters. The estimate of a_2, the marginal propensity to consume manufactures may well be on the high side.[1] If a_2 is reduced from 0·50 to 0·45 in equation (14) the length of the cycle for a 3 months period is reduced from 40 months to 36 months, with deviations at successive peaks declining by about 50%. The alternative model defined by equation (10) with a 3 period distributed lag in the manufacturers' desired inventory change again produces a somewhat shorter cycle of 12 periods when fitted with parameters for a 3 month unit period ($a_2 = 0{\cdot}50$) with deviations at successive peaks declining by about 40%. It would be reasonable to say that the theoretical models suggest a damped cycle with a length of between 3 and 3½ years.

The index of manufacturing production during the period 1951/57 shows 2 complete cycles, measured between peaks in May 1951, July 1953 and August 1957, of approximately 2 and 4 years duration. The behaviour of the index does not suggest the pattern of an explosive cycle. Consequently, the theoretical cycle is too long to be consistent in periodicity with the 1951/53 cycle and too short for the 1953/57 cycle. Since the average length of the real cycles agrees fairly well with the predicted length it might seem reasonable to invoke the effects of random

[1]Because of the effect of the tax cuts in 1954 which raised consumption relative to G.N.P. See below p 291.

factors as explanation of the differential lengths of the real cycles, but it is possible to suggest some features of these cycles which provide more definite explanations of the discrepancies in periodicity.

It is arguable that the recession of 1954 is to be explained primarily in terms of an autonomous fall in government expenditures resulting from a readjustment of the U.S. Defence programme. In terms of 1954 values Government purchases of goods and services declined from 1953/54 by \$9·3 billn. of which only 0·5 billn. represents the compensation of government employees. In comparison construction expenditures rose by \$2·1 billn., expenditure on producers' durable equipment fell by \$1·7 billn. merchandise exports fell in volume by 3%, approx. \$0·5 billn. and the change in non-farm inventory investment was —\$3·2 billn. The decline in government expenditure was accompanied by large tax cuts so that consumers' expenditure actually rose by \$2·9 billn. giving a net decline in G.N.P. of \$5·9 billn.[1] It is relevant also to notice that the increase in U.S. Government expenditures on defence from 1952/53 was substantially less than the increase from 1951/52. In terms of constant 1954 prices total government expenditures rose by \$13·7 billn. 1951/52 and by \$6·7 billn. 1952/53. The decline in the rate of increase of government spending more than offset the increase in gross fixed investment expenditures of \$2·3 billn. compared with a decrease of \$0·2 billn. from 1951/52.[2]

The change in inventory investment can obviously be regarded as dependent on the substantial real decline in government purchase of goods and therefore unrelated to any structural inventory cycle. Such a view, however, requires qualification. In his interesting study of the 1953/54 recession Mr. Hickman has argued that " the contraction was more than a passive response to the decline in government demand . . . the rate of growth of consumer spending diminished before the downturn, and there is evidence that this development led to an early independent decline in consumer goods production."[3] Mr.

[1] *Survey of Current Business*, July 1958, Table 7, p. 11. Exports from *Business Statistics* 1957, pp. 103, 106.

[2] Data from *Survey of Current Business* July 1958, Table 7, p. 11.

[3] Bert G. Hickman, " The Contraction of 1953/1954 " *Review of Economics and Statistics*, February 1958, p. 36.

Hickman shows that the absolute increments in consumers' expenditure were declining from the last quarter of 1952 to the second quarter of 1953 and that purchases of consumer goods fell by as much as defence expenditures in the last half of 1953.[1] He also draws attention to the fact that the change in the rate of inventory investment at annual rates, seasonally adjusted, between the second and fourth quarters of 1953 was — $8 billn.[2] Using the revised data for the seasonally adjusted quarterly components of G.N.P. at annual rates, consumption of goods declined by $3·4 billn. from the second to the fourth quarter of 1953, Federal defence expenditures fell by $2·9 billn. whilst the decline in the rate of inventory investment (non-farm) was $8·3 billn.[3] The deceleration of consumer purchases remains valid if the current values are deflated by the B.L.S. index of consumer prices whilst the 1952 data shows an acceleration of spending, if the effects of the steel strike on automobile sales in the third quarter are allowed for. Mr. Hickman concludes " that a large proportion of the 8 per cent drop of industrial production between July and December was due to inventory disinvestment, and a large share of the latter was induced by the fall in consumption expenditures."[4] It is not clear whether Mr. Hickman regards the early stages of the recession as the operation of a structural inventory cycle[5] but the evidence discussed seems quite consistent with such a cycle. Confirmation is supplied by analysis of deflated retail trade sales, by quarters, with the quarterly average volume of deflated trade inventories. Retail sales decline through 1951 to a trough in the fourth quarter, rise to a peak in the first quarter of 1953 and fall to a trough in the first quarter of 1954. The volume

[1]*Op. cit.*, pp. 38, 41. Mr. Hickman notes (p. 39) that the flow of defence contracts had begun to decline before the actual fall in expenditure in the third quarter of 1953.

[2]*Op. cit.*, p. 42.

[3]*Survey of Current Business*, July 1958, Table 9, p. 14.

[4]*Op. cit.*, p. 40.

[5]On pp. 38–9 his argument seems to imply this ; elsewhere one forms the impression that the inventory developments are a response to more or less autonomous changes in the consumption function.

of inventories reproduces the cycle but with a lag of 2 to 3 quarters.[1]

It is suggested, therefore, that the cyclical swing in manufacturing production between 1951 and 1953 was influenced by the structural inventory cycle, which was provoked by the autonomous surge of expenditures associated with the Korean war. The relative shortness of this cycle may be explained by the autonomous decline in government expenditure from 1953/54 following a decline in the rate of increase from 1952/53, which accelerated the final stages of the inventory upswing and induced a premature decline.

The shortness and mildness of the 1954 recession can be explained partly in terms of autonomous increases in consumers' expenditure which followed the substantial tax cuts of 1954. Real consumption rose by \$2·9 billn. (1954 prices) from 1953/54 despite a fall in G.N.P. of \$6 billn.[2] The increase in real consumption together with an increase in gross fixed investment of some \$6 billn. from 1954/55 helped to induce a substantial change in the direction of non-farm inventory investment of \$7·5 billn. from 1954/55.

From 1955 to 1957 conditions were relatively favourable for the operation of the structural inventory cycle. The level of total fixed investment plus government expenditures increased steadily by about \$0·7 billn. per year, though there were fluctuations

[1] Using data in current values supplied by the U.S. Department of Commerce. Retail sales were deflated by the Department of Commerce index of consumer prices. Wholesale inventories (quarterly average) were deflated by the quarterly average wholesale price index (all commodities) and retail inventories (quarterly average) by the average consumer price index for the current and preceding quarters. The deflating procedure is of a crude nature but probably does not seriously misrepresent the real trends.

[2] *Cf.* Hickman, *op. cit.*, pp. 41–3. There seems to be some controversy on the question whether the increase in consumption was autonomous in relation to disposable income or merely a response to the autonomous tax cuts. The second factor seems to have been more important. If disposable income is deflated by the implicit price index for all consumption, from the G.N.P. accounts and plotted against aggregate consumption (1954 prices) the observation for 1954 shows a deviation from the regression line for 1951/57 of only +0·1% but the observation for 1953 deviated by − 0·4% probably because of the relatively low automobile sales of that year. In comparison when aggregate consumption is plotted against G.N.P. the deviations from the 1951/57 line for 1953 and 1954 are −1·3% and +1·9% respectively. Also real disposable income in 1953 was 0·8% below the trend value of the disposable income/G.N.P. trend line for 1951/57.

inside the different categories. Exports also showed an upward trend.[1] If the 1957/58 recession is to be explained by a structural inventory cycle, the discrepancy between the theoretical and actual periodicity of this cycle must be sought in the structure of the model, rather than in the effects of autonomous factors, though it will be suggested presently that some variation in the rate of government expenditure in late 1956 and early 1957 cannot be excluded as a causal factor. A structural explanation of the difference in timing may be found in an abnormally long time-lag between manufacturers' sales and inventories. It was noted earlier in this paper that the duration of the inventory cycle is sensitive to variations in the length of the time-lag relating desired changes in inventories with changes in sales in the manufacturing sector. In the present case increasing the manufacturers' stock-sales lag in equation (14) by 1 period lengthens the cycle by about 2 unit periods and introduces a double peak, whilst reducing the lag to one unit period shortens the cycle by 2 unit periods. The modification to a 3 period lag produces remarkable agreement between the theoretical and actual cycles but this is probably no more than coincidence. The peculiar nature of the upper turning point in 1956/57 can be explained by an abnormally long inventory-sales lag in the manufacturing sector but of an occasional rather than systematic character.

A notable feature of the 1957 recession is the relative stability of manufacturing production in the eighteen months or so preceding the final turning point in August 1957. The average volume of production for 1957 was less than 1% higher than the average for 1956, whilst the August 1957 value of 147 was actually exceeded in December 1956 (149) and practically attained as early as January 1956 (145). Signs of an incipient recession can be detected in the first half of 1956. The quarterly value of retail sales deflated by the Department of Commerce consumer price index declined from $47·0 billn. (1954 prices) in the fourth quarter of 1955 to $46·5 billn. in the first quarter of 1956, and $46·6 billn. in the second quarter. The real volume of wholesale and retail stocks which had been rising steadily from the fourth quarter of

[1] *Survey of Current Business*, July 1958, Table 7, p. 11; *Business Statistics* 1957, p. 102; *Survey of Current Business* May 1958, p. S.21. Merchandise exports roughly converted to 1954 prices increased by about $2 billn. in 1956 and $1 billn. in 1957.

1954 began to fall slowly from the second quarter of 1956. The check to retail sales was reversed in the third quarter of 1956 but the level was then more or less constant until the second and third quarters of 1957.[1]

The impact of these changes should be visible in the real volume of manufacturers' sales and these (deflated by the B.L.S. wholesale price index for all commodities) show a decline from \$80·6 billn. (1954 prices) in the first quarter of 1956, to \$78·4 billn. in the third quarter. Manufacturers' sales recovered, however, to a peak of \$82·9 billn. in the first quarter of 1957 after which they began a fairly rapid decline. The real volume of manufacturers' inventories, which had been rising rapidly since the first quarter of 1955, and which, according to the theoretical model, should have reflected the 1956 sales peak with a lag of 2 quarters, actually continued to rise until the first quarter of 1957. The substantial increase in manufacturers' inventories, approximately \$4·3 billn. (1954 prices), from December 1955 to December 1956, must have played a large part in stabilising manufacturing production during 1956 in the face of the temporary decline in sales. The increase in manufacturers' sales in the final quarter of 1956 and the first quarter of 1957 may be accounted for by government expenditures on goods and services which increased noticeably during this period after being more or less stable in terms of current prices from the fourth quarter of 1955 to the second quarter of 1956.[2]

Thus although no theoretical explanation can be given for the abnormal time lag in the manufacturing sector in 1956/57, the existence of this lag together with the autonomous developments in government expenditures help to explain the relatively long duration of the 1953/57 inventory cycle.

SUMMARY AND CONCLUDING REMARKS

(1) The purpose of the article has been to consider whether the Metzler type of structural inventory cycle model is consistent in terms of periodicity and stability with the typical short 2—4 year business cycle of U.S. experience.

[1]The volume of trade stocks is calculated as above p. 291.

[2]The increases in the quarterly totals (seasonally adjusted at annual rates) were \$2·6 billn. 1956 (4) and \$3·0 billn. 1957 (1). See *Survey of Current Business*, July 1958, Table 9, p. 15.

(2) The test procedure involved an estimate of the length of the unit period or multiplier time period and this was derived indirectly using data relating to the income velocity of money. It was argued that the well-known difficulties involved in this approach, *e.g.*, the problem of idle balances, did not preclude the possibility of specifying upper and lower limits to the value of the unit period. For the period since 1920 the average length of the unit period can be taken as about 3 months with upper and lower limits of 4 months and 2 months.

(3) The main parameters of the model, the marginal propensities to consume goods and services and the inventory-sales ratios of businessmen in trade and manufacturing have not been invariant over the whole period from the 1920's to the 1950's. But the parameters have shown reasonable stability during sub-periods like the 1920's, the middle and late 1930's and the 1950's. The values of the marginal inventory-sales ratios during these sub-periods have tended to be similar even when the regression lines between inventories and sales have tended to shift following disturbances like the great depression of the early 1930's, the second world war and the Korean war.

(4) The standard Metzler type of model of the inventory cycle which leads to a 2nd order difference equation when fitted with approximate values of the parameters for the 1920's gave a cycle with a periodicity range of about 38 to 52 months but the cycle was explosive even for the most stable case involving a unit period of 4 months. When modifications were made to the model involving separate treatment of goods and services and a more correct valuation of inventories the instability of the model was greatly reduced and the periodicity of the model ranged from 2 to 4 years with an estimate of 3 years for a unit period of 3 months, the cycle being just outside the limits of stability.

(5) The model was amended to allow for separate treatment of the trade and manufacturing sectors, since neglect of this feature may cause the model to understate the degree of instability. The amended model involved a 5th order difference equation. The properties of this sort of model have been tested by the empirical method of generating test sequences for given sets of parameter values. Results show that the higher order model does not lead to greater instability as compared with the

equivalent 2nd order model and the periodicity shows fairly small change. The higher order models also show the same relative insensitivity of periodicity to changes in the inventory-sales ratios. As in the 2nd order case periodicity is fairly sensitive to changes in the marginal propensity to consume. Periodicity is also sensitive to changes in the lags in the operation of the desired inventory-sales behaviour in the manufacturing sector.

(6) For the 1920's the 2 sector model of paragraph (5) gives results which are consistent with the observed cycles. The upper and lower limits to the length of the cycle are about 4 and 2½ years and for a 3 month unit period the model, and minor variants of it, give an estimated length of about 3 years. The models tended to be explosive, or nearly so, for an inventory-sales ratio in the manufacturing sector based on the regression value for 1920/38. However, with a value based on the period 1924/28 the models are damped for a unit period of 3 months or more.

(7) The apparent disappearance of the short cycle in the U.S.A. between 1929 and 1937 is consistent with the inventory cycle model when allowance is made for the changes in parameters and the nature of business inventory-sales policy during the great depression. For the period 1929/35 the model produces cycles with a very high order of damping and which are therefore likely to have been obscured by the influence of autonomous and random elements of expenditure. There is some suggestion of a minor peak in 1931 which is consistent with the behaviour of the theoretical cycle for that period. After 1935 there was a definite change in the inventory-sales policy of businessmen. The theoretical model predicts an explosive cycle during the period 1935/37 and a damped 3 year cycle for 1937/41. This behaviour seems reasonably consistent with the facts allowing for the influence of government fiscal policy during the 1937/38 recession and the disturbance caused by the onset of war in 1939.

(8) From 1945/50 the basic parameters of the model were not stable enough to allow testing but the 1948/49 recession seems to be explainable largely by inventory policy on an *ad hoc* basis. From 1951/57 conditions are relatively favourable for testing the model which again suggests a gently damped 3 year cycle. This is consistent with the observed cycles if allowance is made for the effects of government fiscal policy in 1953/54 and 1956/57. The

length of the 1953/57 cycle and the peculiar nature of the upper turning point is connected with an abnormal lag in the inventory-sales policy of manufacturing business during 1956/57.

The analysis seems to support the case for interpreting the short cycles in U.S. business since 1920 as having been caused substantially by a structural inventory cycle. The cycle is obviously far from being a pure type ; apart from cases where government fiscal policy has modified the cyclical pattern there are several shifts in the inventory-sales relations which have had to be regarded as exogenous to the model. It is also highly probable that accurate measurements of the marginal propensities to consume goods and services and of the inventory-sales ratios in terms of deflated quarterly data would indicate random variations in these parameters together with irregularities in the lags which could affect the length and stability of the cycle. Moreover the analysis depends on the assumption that the multiplier time period has a relatively constant average length of about 3 months.

If the assumed value of the multiplier period is reasonably correct the other reservations are probably not of great importance since not even the most enthusiastic supporter of the structural inventory cycle would expect it to operate in a pure and mechanical way. The fact that the data suggests that for periods of several years at a time there may be stability of the main parameters means that some sort of minor fluctuation is bound to occur in U.S. manufacturing production. If the parameters retain their values for the 1951/57 period and there are no significant disturbances in effective demand arising from autonomous investment and government policy, the U.S. should have a further minor recession around 1960/61.

An interesting and possibly dangerous feature is that the theoretical inventory cycle for the U.S.A. seems to be very near to the point of instability. It may be that modifications of the model are possible which would increase the degree of damping without substantially changing the periodicity of the model, but the properties of the model discussed here point to an implicit criticism of the analysis which can usefully be dealt with at this stage.

It can be argued that an important weakness of the model is the failure to deal separately with the durables and non-durables sectors of production. This is because the durables sector of manufacturing production shows the greater percentage fluctuation over the short cycle though not necessarily the greater absolute amplitude. Some part of the durables sector is covered by the marginal propensity to consume manufactures but the coverage is almost certainly inadequate. It is therefore possible that the attempt to demonstrate that the inventory cycle model produces a damped cycle is misconceived, since the existence of even a relatively small accelerator in the field of fixed investment could interact with the inventory cycle and produce an unstable cycle in aggregate production. This would not seriously upset the conclusions concerning periodicity but the whole structure of the model would need to be changed to produce behaviour consistent with the apparently damped fluctuations that arise in reality.

One way of dealing with this sort of argument would be to repudiate the theory of the multiplier-accelerator interaction in so far as this relates to fixed investment. The idea of business-men constantly attempting to adjust their stock of fixed capital equipment every 3 months or so to a fluctuating level of final demand, which at each stage is regarded as being relatively permanent, is far from plausible. Apart from this there are the familiar points that non-availablity of finance may prevent or delay reactions, otherwise valid, and the difficulties which arise from the existence of surplus capacity especially in relation to the downswing of the cycle when the interaction mechanism may be cut out. These difficulties either do not apply to the inventory interaction model or they apply with less force, *e.g.*, finance for extra working capital may be forthcoming fairly easily from the banking system especially if the volume of bank advances is demand determined, a build-up of inventories, even if subsequently proved to have been unjustified, is much easier to liquidate than a similar build-up of fixed capital, whilst disinvestment of inventories in the downswing is not subject to the limitations which apply to disinvestment of fixed capital. There is the further point that attempts to verify the existence of the acceleration principle in relation to fixed investment have not been conspicuously successful. On general grounds we might

expect to find the level of business construction to be determined autonomously or, at any rate, very loosely coupled to the rate of change of final demand. The case of producers' durable equipment is different. Here the shorter life of much equipment and the fact that expenditures of this type invariably decline in short cycles means that the accelerator and the interaction model cannot be ruled out.

The decline in expenditures on producers' durables in the short recessions does not necessarily involve the operation of the accelerator. It could also be explained in terms of a relationship between the level of the expenditures and the level of final demand, for which there seems to be some empirical support,[1] the rationale of this relationship being that much of this equipment is self-financed out of current and recently earned profits. This factor could be introduced into the inventory cycle model in the form of a marginal propensity to consume producers' durables which would interact *directly* only with the manufacturers' inventory-sales ratio.

The case against amending the inventory cycle model in this way, and also against incorporating a fixed investment accelerator in parallel with the inventory accelerator rests on the belief that the mechanism of the model is inappropriate for the producers' durables sector, where the existence, normally, of a stock of unfilled orders can operate as a stabiliser. The assumption here is that variations in the demand for producers' durable equipment will, in the first instance, increase or decrease the stock of unfilled orders and that output will be expanded or contracted relatively smoothly in response to the new situation, in effect as if the change in demand operates on the level of output with a complex distributed lag. In this way considerable variations in the rate of production of producers' durable equipment could be compatible with a relatively small effect on the amplitude of the inventory cycle.

If it could be shown that the introduction of a durables sector would nevertheless produce an explosive cycle it would still be possible to tame the explosions by converting the sort of

[1]In the 1920's, the 1930's and the 1950's there is a tendency towards a straight line regression between producers' durables and G.N.P. The slope of the regression line is much the same for the 1920's and the 1930's but is substantially different in the 1950's.

model created by Professor Hicks into an inventory cycle model. The upswing of the cycle could be explosive until some point where capacity factors reduce the possible and actual rates of growth and produce a normal upper turning point. The recession phase of the model could very well be non-explosive given a Duesenberry-Modigliani type of consumption function to reduce the effective marginal propensity to consume for the downswing. The model would produce an endogenous lower turning point whether it was explosive or damped during the recession phase, since the inventory accelerator can operate effectively on a falling level of final demand. Thus in the absence of disturbances caused by government policy the model would be capable of producing a complete and regenerating cycle without the need for somewhat artificial assumptions to explain the lower turning point. We may hazard the guess that the periodicity of such a model would not differ substantially from the models presented in this paper. The comparative insensitivity of periodicity to changes in the inventory-sales ratios would ensure that the switching from explosive to non-explosive phases would have little effect on the duration of the cycle. Periodicity would, therefore, be determined primarily by the marginal propensity to consume and this would be little different from the values assumed in this paper. In practice it is clear that modifications to the pure cyclical pattern would arise from the induced effects of government fiscal policy.

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Cycles, Accumulation and the Growth of Capacity*

The following sections attempt to analyse the effect of cycles in output upon the growth of capacity. Unfortunately, the assumptions made in the process are highly restrictive, but some insight into the orders of magnitude involved in the real world may still be given.

That cycles can influence the long-run trend of the economy is almost trivially obvious, and any disagreement is more likely to be about the direction and importance of such an effect than about its existence. The most common attitude seems to be that cycles will slow down the growth of capacity relative to the case in which output is permanently at the capacity level. For example, the following quotations are from two of the recent, general treatments of economic growth.

> 1. " A hypothetical economy, growing with no cyclical disturbances, would stay on a path of dynamic equilibrium. Such a path would presumably move at a higher level than do the statistically observable trend paths."[1]
>
> 2. " . . . dynamic equilibrium must necessarily be an unrealistic concept, and yet . . . in the form of observable trend lines it tends to become realistic for the purpose of long-run analysis, except that an allowance must be made for the " waste " caused by fluctuations."[2]
>
> 3. " On the whole the author is inclined to the tentative view that relatively full employment, steadily maintained, is likely to produce higher growth rates than if an economy were subject to business cycles."[3]

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The writer is indebted to Mr. R. M. Goodwin (Peterhouse) and Mr. G. Mills (University of Sheffield) for valuable comments.

[1]W. J. Fellner, *Trends and Cycles in Economic Activity* (Henry Holt ; New York : 1956), p.16.

[2]*Ibid.*, p.194.

[3]W. W. Rostow, *The Process of Economic Growth* (Clarendon ; Oxford : 1953), p. 97.

A similar position is adopted here and elaborated in the subsequent sections. To summarise these, I sets out some general assumptions which underlie the discussion ; II outlines the general approach ; III, the central part of the analysis, formulates specific dynamic models and compares their development over time ; IV considers the quantitative possibilities ; V contains two brief subsidiary applications of the analysis ; and VI reiterates some conclusions. The constituent ideas are all well known. In particular the use of the traditional production function is due to Haavelmo[1] and Solow[2], and the stress upon the interrelationship of capacity and output to Domar[3] and Smithies.[4] But these ideas do not seem to have been combined in a close analysis of the present problem, although there is at points a formal similarity to a study by Eisner.[5]

I. General Assumptions

The following assumptions sweep away many problems and allow the remainder to be discussed in a fairly concise and unambiguous way. The hope is that those aspects left are the essential ones and that the questions assumed away are incidental to the problem in hand.

Throughout, discussion is in terms of a " manufacturing-industry " economy, neglecting international trade and the role of the government. This economy has the following properties. 1. Only one commodity is produced, being used as a consumption good and somehow transformed into a capital instrument in a one-to-one relationship. Its physical units are easily defined and of standard quality. 2. The labour force is fixed at any moment of time, in terms of hours offered as well as in terms of the number of workers. Labour hours are homogeneous. 3. Capacity

[1]T. V. Haavelmo, *A Study in the Theory of Economic Evolution* (Contributions to Economic Analysis, III ; North Holland ; Amsterdam : 1954), especially Part II.

[2]R. M. Solow, " A Contribution to the Theory of Economic Growth ", *Quarterly Journal of Economics*, Vol. LXX (Feb., 1956), pp. 65-94.

[3]E. D. Domar, *Essays in the Theory of Economic Growth* (Oxford University Press ; New York : 1957), Essays 3 and 4.

[4]A. Smithies, " Economic Fluctuations and Growth ", *Econometrica*, Vol. XXV (Jan., 1957), pp. 1-52.

[5]R. Eisner, " Underemployment—Equilibrium Rates of Growth ", *American Economic Review*, Vol. XLII (Mar., 1952), pp. 43-58. (Eisner analyses the implications for the Domar equilibrium-growth rate of assuming a constant proportion of unused capital).

production (X) at any time is given by using the labour force and capital stock so as to maximise the flow of output *net* of depreciation. There is sufficient flexibility in factor substitution to preclude redundancy of either factor, even for short periods, so that X is given by a neoclassical production function

$$X = A\ (K, L, T)$$

when K is the stock of capital, L the labour force and T an index of technique, raising X for given K, L. The function "A" is unique and differentiable, with positive but non-increasing partial derivatives over the range of values considered. 4. All depreciation is actually made good so that production at capacity has no deleterious effects upon future capacity. 5. Actual net output is determined without lag by *real* effective demand (Y). The assumptions about Y are indicated under II, but it follows from definition that capacity output cannot be exceeded by actual output ; hence

$$Y \leqslant X$$

Whenever $Y < X$ there is unemployment of one or both factors in some systematic way, but this only has importance through its effect upon saving. 6. Planned net saving is given by some simple function of the other variables and is always realised, any unintended adjustment being in inventories. 7. Finally, the rate of net saving gives the effective rate of increase in the capital stock.

These assumptions are too well known to call for detailed comment, although popularity is not necessarily a justification. At very best they are a highly stylised representation of the real world.

II. The General Approach

The underlying model can be thought of as one in which capacity, effective demand, labour force and technology all develop through time in some systematic, interdependent way, being determined as endogenous variables from underlying behavioural and technological relationships, intial conditions and natural, political and social events. We want to determine the effects, within the model, of a structural change—say the introduction of a compensatory monetary policy—which eliminates cycles in output. But such a general model, even if it

could be adequately formulated, would be too complicated to handle. Hence it is necessary to make simplifying assumptions.

The first is to take real output as a *given form of proportional deviation from capacity*. This involves breaking the causal circle of interdependence which governs the development of output and capacity, so that one segment can be introduced as an exogenous factor. The problem then reduces to an examination of the development of the system with differing forms of output deviations, one of these corresponding to the situation with cycles and the other to the changed structure.

It does not have to be supposed that the deviations are totally independent of the trend of the system, or that they are *in fact* exogenous. The only necessity is that the relation between output and capacity, as it emerges in the complete system under a variety of circumstances, should be roughly *approximable* as a simple function of time and *capacity*.[1] An alternative, and less restrictive, interpretation is simply to take the systematic relation between capacity and output for granted as an empirical generalisation and ask what the effects of a different relationship would be. Note that in neither case is the *level* of output over time assumed exogenously, since then a particular juxtaposition of output and capacity would only occur by chance. For, although output—by adjusting the level of current saving and investment—would influence the behaviour of capacity, it is unlikely that the effect would be just enough to produce a predefined correlation between the given time path of output and the resulting time path of capacity. This is particularly the case when it is recalled that the movement in capacity is supposed to be influenced by changes in the labour supply. Instead, it is merely the form of the proportional *deviation* of output from

[1]The models of Goodwin and Smithies might satisfy this condition. [R. M. Goodwin, " A Model of Cyclical Growth ", in E. Lundberg (ed.), *The Business Cycle in the Post-War World* (I.E.A. ; Macmillan ; London : 1955), pp. 203-21 : A. Smithies, *loc. cit.*]. The essential reason in the former is that crucial discontinuities dominate the behaviour of the system and make it relatively unresponsive to changes in many other factors. Thus, Y has an upper limit set by the constraint $Y \leqslant X$, and a lower limit set by the disinvestment " floor " in combination with the saving function. If this " floor " output is expressable as a function of capacity then so is the amplitude of the cycles. All that then remains is to consider the typical time-path of Y between these limits. [For a brief consideration of the " floor " output see Section III iv).].

capacity which is assumed, the *levels* of both variables remaining unknowns to be determined.

The second simplifying assumption made is that changes in the labour force and technology are exogenous, proceeding independently of the rest of the system. This is obviously incorrect and limits the relevance of the analysis. But there does not seem to be much that can be usefully assumed—even as to direction—about the effect upon these variables of differences in market situations, unemployment, degree of uncertainty about the future, and so on, brought about by different forms of output deviations. Hence, even apart from the desire to simplify, there seems to be little alternative.

The effect upon the growth of output and capacity of failure to produce always at the physically-feasible, capacity level is important in itself. For such a failure seems historically evident whatever the particular difficulties of defining capacity. But elimination of all excess capacity does not, strictly, imply the elimination of all cycles in output, for there may still remain cycles in capacity due (say) to Schumpeterian " bunching " of innovations or systematic population variations. Such cycles are ruled out here by assuming, finally, that labour force and technology develop smoothly without short-run irregularities. This is not a very important assumption, but it permits simpler verbal expression.

III Formal Analysis

The analysis is in the form of comparative dynamics, contrasting the time paths of two systems which start from the same position and differ only in the form of deviation of output from capacity. Such a procedure is too difficult to handle verbally and a mathematical treatment is almost necessary. But the techniques needed are simple and well-known.

III (i) *Notation*

The Newtonian notation is adopted for time derivatives.

Let $X =$ capacity level of rate of net output, $Y =$ actual level of rate of net output, $K =$ capital stock (in output units), $S =$ rate of net saving, $L =$ labour force, $T =$ index of technology, $t =$ time.

All flow-rates are measured per unit of time, which can be taken (at will) as one year.

III (ii) *General statement of the problem*

Using the function specified in II, the model to be analysed is defined by the following relationships

(1)	$X = A\,(K, L, T)$	—capacity-production function.
(2)	$\dot{K} = S$	—net-saving-investment identity.
(3)	$L = L\,(t)$	—exogenously-determined labour force.
(4)	$T = T\,(t)$	—exogenously-determined index of technology.
(5)	$S = B\,(X, Y, K, L, T)$	saving function (in most general form).
(6)	$X\text{-}Y = C\,(X, t)$	—assumed form of output deviation.

Note that all lags in the adjustment of capacity and saving are neglected. They seem to be subsidiary to the problem.

Differentiating (1) by t and substituting gives

$$\dot{X} = \frac{\partial X}{\partial K}S + \frac{\partial X}{\partial L}\dot{L} + \frac{\partial X}{\partial T}\dot{T} \tag{7}$$

Now, the marginal-productivity functions will depend upon K, $L(t)$ and $T(t)$ (or, more simply upon K and t) ; but (1) can be inverted to give K in terms of X, L and T (or X and t). Similarly, whenever K appears in the saving function we can substitute a function of X and t, and whenever Y appears the function $X\text{-}C\,(X, t)$. Hence (7) can be written as a differential equation of the first order in X, with t as the independent variable. A general solution $X\,(t)$ exists, providing that the known functions satisfy the usual continuity conditions.[1] A particular member of the class of general solutions can then be chosen by setting $X\,(o)$ at a known initial level, and gives the time-path of capacity upon the assumptions made.

The problem can now be expressed precisely. It is to compare the solutions $X(t)$ of (7) obtained by making different assumptions about the form of the output-deviation function

[1]Compare H. T. H. Piaggio, *Differential Equations* (Bell ; London : 1952 edition), pp. 122-4.

$C(X, t)$. In particular, we want to contrast a realistic case, in which $C(X, t) > 0$ for some t, against a hypothetical one with $C(X, t) = 0$ for all t, output always at capacity and cycles eliminated.

To provide a concise means of reference the first case will be termed " cyclical " and the second (for brevity rather than accuracy) " classical ". And as a matter of notation it will prove useful to distinguish the particular forms of $C(X, t)$ by respectively priming and double priming the C. The solutions obtained with these forms will be denoted by a similar device. Hence $X'(t)$ represents the time-path of capacity in the cyclical case and $X''(t)$ that in the classical.

It is clear that on the assumptions made $X'(t)$ and $X''(t)$ can only diverge as a result of differences in capital stock due to dissimilar patterns of accumulation. Do the Fellner-Rostow conclusions follow in this situation ? Generally speaking they do, although an exception occurs if the " cyclical " average propensity to save is sufficiently greater than the " classical " to prevent the cyclical output deviations slowing down the trend of accumulation. Otherwise, starting from the same level of capacity, the cyclical decline of output below capacity will produce a loss of accumulation relative to the classical case. And this will relatively lower capacity and, a fortiori, output and further accumulation.

But this is only necessary if the labour force and technology are treated as exogenous. It is possible that periodically-unutilised capacity will have a salutary effect in discouraging entrepreneurs from a lazy life and suppressing inefficient producers, so that elimination of cycles may reduce efficiency and slow down innovation. Such a neglected possibility may tend to offset the negative " accumulation effect " of cycles—and if it does this effect will itself be reduced.[1]

III (iii) *The saving function*

The saving function is the same in both the classical and cyclical cases, but this does not imply equality of the average propensities to save. Indeed, if the function includes sufficient determining factors its sameness in both cases may merely mean

[1]But other neglected effects may work in the opposite direction.

that the same people are involved. Even without going so far, there are fairly obvious factors which may tend to alter the saving-income relationship from one case to the other; for example, the prevailing interest rates or income distribution may differ.

Empirically, there does seem to be a distinction between short-run saving behaviour within a cycle and that, on the average, from cycle to cycle. One well-known way of accounting for this has been suggested by Duesenberry and Modigliani (D-M).[1]

An alternative formulation, perhaps more plausible when the importance of corporate saving is considered, has been suggested by Goodwin[2] in terms of a Marshallian asymmetry between the expansion and contraction of long-run commitments. Arguing along these lines, and stressing corporate savings, a case can be made for considering the level of *capacity* relative to the level of income as an indicator of the " squeeze " put upon savings during a depression by accepted consumption standards and long-run commitments. This is a slightly different hypothesis to the *D-M* one, in which the squeeze is indicated by the excess of *past-peak* over current income. But, providing that the peak of output was near the capacity level and that capacity changes only slowly, the two will in practice be very similar. However, the " capacity " approach does introduce a certain downward flexibility in a prolonged depression and—more importantly from a theoretical viewpoint—avoids the awkward discontinuity introduced by the *D-M* hypothesis, thus giving a much more tractable function.

In a linear approximation, we can write such a saving function as

$$S = a_1 Y - a_2 X \quad (1 > a_1 > a_2 > 0) \tag{8}$$

S being lower for any income the higher is capacity. A more convenient form for further work is

[1] J. S. Duesenberry, *Income, Saving and the Theory of Consumer Behaviour*, (Harvard Economic Studies, LXXXVII ; Cambridge, Mass. : 1949) : F. Modigliani, " Fluctuations in the Saving-Income Ratio : A Problem in Economic Forecasting ", *Studies in Income and Wealth, XI* (National Bureau of Economic Research ; New York : 1949), pp. 369-443.

[2] R. M. Goodwin, *loc. cit.*, pp. 213-4. Modigliani's discussion of corporate saving (*loc. cit.*, pp. 403-16) also points in this direction.

$$S=\left(a_1-a_2\left\{\frac{X-Y}{X}\right\}\right)X \quad (1>a_2=d_1>d_1=a_1-d_2>0) \qquad (9)$$

with the parameters renamed.

It is clear that if Y falls regularly below X the observed long-run average propensity to save will be less than a_1, since $\frac{S}{Y} = a_1 - a_2\frac{X-Y}{Y}$ and the long-run average value of $\frac{X-Y}{Y}$ is positive. If $a_1 = a_2$, (9) degenerates into the simple function $S=a_1Y$.

A function such as (8) will roughly *describe* saving behaviour in a realistic " cyclical " case. But to determine the " classical " expansion of capacity a *structural* saving function has to be projected into this hypothetical situation of steady growth. Since we do not really know how savers would then react, any specific saving function cannot claim over-much validity.

III (iv) *The Cycle Function*

Perhaps the most plausible rough pattern for $C'(X, t)$ would be one with excess capacity appearing rapidly in the slump and then being eliminated more slowly in the boom, perhaps with a period at full capacity. If the slump output is sufficiently low to make net saving negative, the elimination of excess capacity will be partly a direct reduction[1] through disinvestment as well as a relative recovery of output.

Note that no upper limit to the rate of disinvestment is explicitly supposed, but the cycle function may reflect one interacting behind the scenes with the saving function. This fits in rather well with the saving function (8). For suppose that the " floor " level of disinvestment (investment if some sectors carry on sufficiently to make total net investment positive) is always a roughly-constant proportion of capacity. Then, with this saving function, the maximum deviation of income in each slump will also be a constant proportion of capacity.[2]

[1]This will merely be a deceleration of a growing X if L and T are rising sufficiently rapidly.

[2]From the saving-investment identity and (8), $I \equiv S = a_1Y - a_2X$ so that $Y/X = (a_2 + I/X)/d$. If (I/X) min. is a constant $(=\beta)$ then (Y/X) min. is also constant $(= (a_2 + \beta)/a_1)$. Strictly speaking, if X is changing, (Y/X) min. will not coincide in time with either Ymin. or $(X\text{-}Y)$ max. But the intervals will be of small order if X changes only slowly.

In any case, that slump income should satisfy this condition seems a reasonable hypothesis, and it has the added virtue of simplicity. A " stagnationist " situation (with the maximum deviation of income becoming over time a greater proportion of capacity) could be considered, but is more cumbersome and not particularly plausible.[1] For simplicity, too, the form of the cycle is approximated by a sine curve, so that

$$C'(X,t) = \xi\,(\text{Sin}\,\overline{\theta t + \lambda} + 1)\,X \qquad (0<\xi<0{\cdot}5) \qquad (10)$$

The maximum deviation of output from capacity in each slump is (approximately) $2\,\xi\,X$, and the minimum in the boom is zero. The period of the cycle is determined by θ[2] and the initial phase by λ (both in radians). The *proportional* deviation of income from capacity is a function of time only, and it will prove useful to denote this as

$$\frac{C'(X,t)}{X} = \nu'(t) \qquad (11)$$

By analogy, $\nu''(t)$ is the proportional deviation in the classical case ($\equiv 0$) and $\nu(t)$ is the general form denoting either. The average level of $\nu'(t)$ from cycle to cycle is given by ξ.

It is easy to modify the assumption that output actually reaches capacity in the boom, and this turns out to have little effect upon the results—providing that ξ remains unchanged.

III (v) *The production function*

The problem here is again one of balancing simplicity and plausibility, and two forms are used. First, is the linear function

$$X = \beta_1 K + \beta_2 L + (\beta_0 + \beta_3 T) \quad (\beta i>0) \qquad (12)$$

which has constant marginal productivities, β_1, β_2 (*w.r.t.* K, L), and a shift, β_3, for advancing technology; second, the well-known, Cobb-Douglas

$$X = K^{\epsilon_1} L^{\epsilon_2} (\beta T^{\delta}) \begin{cases} 0<\epsilon_i<1 \\ 0<\beta,\ \delta \end{cases} \qquad (13)$$

with constant elasticities of productivity (ϵ_1, ϵ_2 *w.r.t.* K, L) and, if the elasticities are less than one, declining, but positive,

[1] The simplest hypothesis of all is to make $C'(X,t)$ a function of time only. But, unless the increase in the amplitude of the cycles coincides with the endogenous expansion rate of the economy, such cycles will eventually involve unreasonably small or large proportionate fluctuations in output.

[2] The period is $2\pi/\theta$ years.

marginal products. The restrictions required for the latter are imposed at the outset, but it does not particularly matter what we assume about returns to scale. The expression in brackets is a composite scale factor and time shift. The index of technology is supposed to inflate output in a " neutral " manner (in Solow's[1] sense).

The linear function gives the problem in its simplest form and the other, whilst more cumbersome, illumines certain further points and probably gives more satisfactory numerical results. Both functions can be regarded as approximations to an actual surface in K, L, T, X space, but the effectiveness of the approximation for *all* the surface does not matter. It is only the fit about the expansion paths $(L(t), T(t), K'(t))$ and $(L(t), T(t), K''(t))$ which influences the result.[2]

III (vi) *The comparative dynamics of capacity*

From the manifold formal possibilities a particular saving function and two particular production functions have been chosen. These, together with the alternative versions of the cycle function, give 4 solutions of equation (7). The solutions for the different production functions are considered separately. An exhaustive analysis would be tedious, and, in any case, interest is in general qualitative results rather than the detailed properties of the models. Hence, a rigorous development is not attempted.

Model I—linear production function, saving function (9).

Substituting the particular forms from (9), (11) and (12) in (7) gives.

$$\dot{X} = \beta_1 \{a_1 - a_2 \nu(t)\} X + \beta_2 \dot{L}(t) + \beta_3 \dot{T}(t)$$

and this linear equation has the solution [3]

$$X(t) = e^{\beta_1 \int_0^t \{a_1 - a_2 \nu(t)\} dt} \left[\int_0^t \left(\beta_2 \dot{L}(t) + \beta_3 \dot{T}(t) \right) \left\{ e^{-\beta_1 \int_0^t \{a_1 - a_2 \nu(t)\} dt} \right\} dt + X_{(0)} \right] \quad (14)$$

[1]R. M. Solow, *loc. cit.*: see also idem, " Technical Change and the Aggregate Production Function ", *Review of Economics and Statistics*, Vol. XXXIX (Aug., 1957), pp. 312-20.

[2]When $K'(t)$ and $K''(t)$ denote the time-paths of capital stock in, respectively, the cyclical and classical case.

[3]Compare Piaggio, *op. cit.*, paragraph 19.

For simplicity write (14) in the form

$$X_{(T)} = X_{(0)}e^{\int_0^T r(t)dt} + \int_0^T \Phi(t)\left\{e^{\int_t^T r(t)dt}\right\}dt \qquad (15)$$

This brings out the formal equivalence to a compound-interest problem. The isomorphism is this; the first component of the *R.H.S.* is the value at T of a sum $X_{(0)}$ continuously compounded from O *to* T at the force of interest $r(t)$, which varies with the time elapsed[1]; the second component is the value at T of a sinking fund formed by a stream of payments $\Phi\ (t)$, made between O and T, and continuously compounded at $r(t)$[2].

The economic basis becomes obvious upon reflection. Just as money accumulates at compound interest, capacity has been assumed to have an endogenous rate of growth. This appears through the sequence.

capacity $\rightarrow$ output $\rightarrow$ saving-investment $\rightarrow$ higher capacity.

The force of interest, $r\ (t) = \beta_1\ (\alpha_1 - \alpha_2\ \nu\ (t)\ )$, depends upon the proportions involved in this sequence. The level of capacity at T depends upon the initial level $X_{(0)}$ and upon the exogenous increases, $\Phi\ (t) = \beta_2\dot{L}(t) + \beta_3\dot{T}\ (t)$, due to greater labour supply and improved technology. These increases have been assumed indistinguishable from endogenous ones in their effect upon further accumulation.

For the cyclical case, when $\nu\ (t) = \nu'\ (t)$, (14) cannot generally be integrated by elementary methods. Thus, discussion is restricted to the special cases, first with $\Phi\ (t) \equiv O$, and second with $\nu'\ (t) = \xi$ (permanent excess capacity at the cycle-to-cycle average proportion replacing the cycles).

In the first case, particular solutions, $X'\ (t)$ and $X''\ (t)$, of (14) have the ratio

$$X''\ (t)/X'(t) = \text{exp.}\ [\beta_1\alpha_2\xi\,\{t + \frac{1}{\theta}(\text{Cos}\ \lambda - \text{Cos}\ \overline{\theta t + \lambda})\,\}] \qquad (16)$$

Hence, the proportion of capacities diverges over time at an increasing absolute rate. This is to be expected, for the only way in which divergence might be restricted is through a decline in the

[1]Compare D. W. A. Donald, *Compound Interest and Annuities-Certain* (Cambridge University Press: 1953), p. 20.

[2]Compare R. G. D. Allen, *Mathematical Analysis for Economists* (Macmillan; London: 1938), p. 402. The statement there that the formulae presented hold for varying interest rates is incorrect. But reformulation is not difficult.

" classical " marginal product of capital relative to the " cyclical". This is ruled out by assumption, so that the divergence always increases with the product of β_1, a_2 and ξ.

The cycles in (16), which are of constant proportional amplitude, are due to induced fluctuations about the trends of accumulation and capacity in the cyclical case. Regarded as deviations from trend, these fluctuations have a later phase than those in output—reaching a peak $\frac{1}{4}$ of a cycle afterwards. The reason is that " cyclical " capacity continues to increase relative to its trend so long as output is above its average level—which will be the case for the $\frac{1}{4}$ cycle following the peak of the boom. The effect of this lagged behaviour of $X'(t)$ upon (16), where it appears in the denominator, is to produce an equal *lead* over the cycles in output.

Finally, consider the trend of (16) as determined by connecting observations made at the intermediate stages of each of its cycles. The result is the same as that obtained by assuming excess capacity at the constant proportion ξ, in deriving (16), only if the initial phase of $\nu'(t)$ is either at a peak or at a trough[1]. The implication is that to start the process off at a particular phase of the cycle can confer a benefit, or loss, which is permanent and carried over from cycle to cycle. This dependence of (16) upon the initial phase of $\nu'(t)$ illustrates a general property of the model. The essential point is that output now is not equivalent in its effect upon the long-run trend to the same output sometime in the future. For it will have given rise in the interim to a compounded growth of capacity.

However, both trends lie within the band generated by the cycles in (16) and this will generally be narrow. The simpler derivation can then be used as a trend approximation.

Now consider the second special case of Model I, with L and T growing but with steady excess capacity in the " cyclical " case. The ratio of capacities is

$$\frac{X''(t)}{X'(t)} = e^{\beta_1 a_2 \xi t}\left[\frac{\int_0^t \Phi(t)\left\{e^{-\beta_1 a_1 t}\right\}dt + X_{(0)}}{\int_0^t \Phi(t)\left\{e^{-\beta_1(a_1 - a_2\xi)t}\right\}dt + X_{(0)}}\right] \qquad (17)$$

[1]If the trends are to correspond (16) must equal exp. $[\beta_1 a_2 \xi t]$ at the observation points. This requires Cos $\lambda = 0$ and, therefore, $\sin\lambda = +1, -1$ and $\nu'(o) = 2\xi, 0$.

when $\Phi(t) = \beta_2 \dot{L}(t) + \beta_3 \dot{T}(t)$. With $\Phi(t) > 0$ for all $t>0$, it is clear that the definite integral in the denominator is greater than the one in the numerator, making the fraction in [ ] less than one for any $t>0$. Comparing (17) with (16), it is then clear that (cet. par.) the introduction of a steadily growing L and T always lowers the ratio $X''(t)/X'(t)$. Just what happens is fairly clear. An increase in L and T tends directly, on the one hand, to raise capacity whilst preserving the absolute gap between the two cases and indirectly, on the other, to increase the divergence of accumulation and capacity by increasing the absolute amount of excess capacity in the " cyclical " case. The direct effect must dominate sufficiently to lower the deviation $X''(t)/X'(t)$, although insufficiently to prevent it increasing over time.[1].

Model II Cobb-Douglas production function, saving function (9).

Equation (7) now becomes (substituting from (9), (11) and (13)),

$$\dot{X} = \{a_1 - a_2\nu(t)\}\psi(t)X^{2-1/\epsilon_1} + \left\{\epsilon_2 \frac{\dot{L}(t)}{L(t)} + \delta \frac{\dot{T}(t)}{T(t)}\right\} X$$

$$[\psi(t) = \epsilon_1 \{L(t)^{\epsilon_2}(\beta T(t)^{\delta})\}^{1/\epsilon_1}] \tag{18}$$

Its solution, obtained by the method sketched in the appendix, has the form

$$X(t) = \overline{X}(t)\left[1 + \Omega\int_0^t \{a_1 - a_2\nu(t)\}\overline{\frac{\partial X}{\partial K}}(t)\, dt\right]^{1/\Omega}$$

$$\left[\Omega = \frac{1}{\epsilon_1} - 1 > 0\right] \tag{19}$$

when $\overline{X}(t)$ and $\overline{\frac{\partial X}{\partial K}}(t)$ are the time paths for, respectively, output and marginal product of capital obtained if capital remains fixed at the *initial* level and only L and T are allowed to change. Both paths are simple functions of the exogenous variables $L(t)$ and $T(t)$, and are unchanging if L and T are constant too.

[1]The latter is, at least, true for $L(t)$ and $T(t)$ each given by a linear combination of exponential functions.

The ratio $X''(t)/X'(t)$ is given by

$$\frac{X''(t)}{X'(t)} = \left[1 - \frac{a_2\int_0^t \nu'(t)\frac{\overline{\partial X}}{\partial K}(t)dt}{a_1\int_0^t\frac{\overline{\partial X}}{\partial K}(t)dt + \frac{1}{\Omega}}\right]^{-1/\Omega} \tag{20}$$

To avoid over-complication, suppose that L and T are growing at the constant proportional rates π_1 and π_2 respectively. Then $\frac{\overline{\partial X}}{\partial K}(t)$ takes the form $\frac{\partial X}{\partial K}(o)\, e^{\rho t}$, when $\rho = \epsilon_2\ \pi_1 + \delta\pi_2 \geqslant O$ and $\frac{\partial X}{\partial K}(o)$ is the initial marginal product of capital.

If, additionally, excess capacity in the " cyclical" case is at the constant proportion ξ, (20) integrates to give

$$\frac{X''(t)}{X'(t)} = \left[1 - \frac{a_2}{a_1}\xi\left\{1 + \frac{\rho}{e^{\rho t}-1}\left(\Omega\frac{\partial X}{\partial K}(o)a_1\right)^{-1}\right\}^{-1}\right]^{-1/\Omega} \tag{21}$$

This expression increases with t, but converges upon the limit $\left(\frac{a_1}{a_1 - a_2\xi}\right)^{1/\Omega}$. Its behaviour as L and T become constant and $\rho \to 0$ is obtained by substituting t^{-1} for $\rho/(e^{\rho t}-1)$ so that the limit approached with t is unaffected but the speed of approach lowered. For finite t the value of (21) will thus be greater for increasing L and T than it is if they are constant (and cet. par.). This is the opposite of the result found for Model I, and indicates that no general conclusion can be drawn on this aspect of the general model. The reason for the disparate behaviour is that rising L and T will now increase the marginal product of any capital stock. Thus their indirect effect upon the ratio $X''(t)/X'(t)$, (that is, increased divergence of capacities due to absolutely-larger cycles) will be strengthened. A given divergence of accumulation will give rise to a greater " spread " of capacity than it would if the marginal product of capital were constant. Indeed, the strengthening is sufficient to make the " indirect " effect outweight the " direct " one—which raises $X'(t)$ and $X''(t)$ whilst preserving their absolute difference—so that the growth in L and T now increases the ratio $X''(t)/X'(t)$.

The non-linearity of the production function means not only that the marginal product of capital can vary in both cases, but also that it can differ between the two. Such a difference explains why $X''(t)/X'(t)$ approaches a limit over time. On the assumptions giving (21), the time-path of the marginal product is governed by the differential equation [1].

$$\dot{\left(\frac{\partial X}{\partial K}\right)} = -\frac{S}{X}\Omega\left(\frac{\partial X}{\partial K}\right)^2 + \rho\left(\frac{\partial X}{\partial K}\right) \tag{22}$$

when S/X, Ω and ρ are constants previously defined. This integrates (by the method indicated in the appendix) to give a solution

$$\frac{\partial X}{\partial K}(t) = \left[\frac{S}{X}\Omega\left(\frac{1-e^{-\rho t}}{\rho}\right) + \overline{\frac{\partial X}{\partial K}(t)}^{-1}\right]^{-1} \tag{23}$$

which is smaller, at any time, the greater is S/X. Hence the "cyclical" case always has the greater marginal product—an expected result since the capital/labour ratio is lower than that in the classical case. The limit of (23) as $t \to \infty$ is $\rho\left[\frac{S}{X}\Omega\right]^{-1}$, so that the system *always* moves towards development with a constant, marginal product of capital. If $\rho = 0$, so that L and T are constant, this limit is zero for both cases, capital saturation appearing. But even then, since the approach to the limit is more rapid in the classical case, the *ratio* of "classical" to "cyclical" marginal products is less than one. In fact,

$$\lim_{t\to\infty} (\partial X/\partial K)''/(\partial X/\partial K)' = (S/X)'/(S/X)'' = (\alpha_1 - \alpha_2\xi)/\alpha_1 \tag{24}$$

whether L and T are increasing or not. From this result the behaviour of $X''(t)/X'(t)$ follows directly, for, by the definition of the Cobb-Douglas function, the ratio of marginal products in the two cases is given by $(X''(t)/X'(t))^{-\Omega}$. Thus, the limiting ratio of capacities is a power of the limit for the ratio of the marginal products.

This is a restricted result, dependent upon the particular form of the production function, but it does indicate a more

[1]Obtained by taking the total time derivative of

$$\frac{\partial X}{\partial K} = \epsilon_1 K^{\epsilon_1 - 1} L^{\epsilon_2}(\beta T^{\delta})$$

general possibility. The lower capital/labour ratio in the cyclical case may, by producing a higher marginal product of capital, limit the divergence of capacities—possibly even producing ranges of convergence. In reasonable cases, however, some permanent divergence is necessary, for if it were eliminated the difference in the capital/labour ratios would disappear, whilst rates of accumulation would still be different. An exception to this occurs if the marginal product of capital eventually becomes zero, for the rates of accumulation will not then influence the development of capacity. If the saturation level for capital is finite[1] and the same in both cases, the " cyclical " case will merely involve a slower approach to saturation. A constant absolute gap $X''(t)-X'(t)$ will then eventually be established, being zero if L and T are constant. In any case, the *ratio* $X''(t)/X'(t)$ will approach unity in the limit, having a maximum value for some finite time. But this is a special case of limited interest.

Finally, if excess capacity is cyclical rather than steady, the behaviour of $X''(t)/X'(t)$ can be determined by integrating (20) with the sinusoidal form for $\nu'(t)$. Nothing particularly unexpected occurs, and the following points can easily be verified :

(i) The long-run trend of capacity again depends to a minor extent upon the particular starting phase of the cycle. But an exception occurs in the limit as $t \to \infty$ if L and T are constant. $X''(t)/X'(t)$ then converges on a level which is independent of the starting phase.

(ii) If L and T are growing, $X''(t)/X'(t)$ approaches a stationary cycle of constant amplitude rather than a fixed limit.

(iii) If L and T are constant, $X''(t)/X'(t)$ approaches a fixed limit, the fluctuations damping out.

(iv) Growth in L and T alters the phase of the induced cycle in $X'(t)$, relative to that found (for finite t) with L and T constant.

The peculiar behaviour when L and T are constant is due to the decline of the marginal product of capital towards zero. The path of accumulation then ceases to affect the level of capacity.

[1]Failure of this condition explains why $X''(t)/X'(t)$ does not approach unity when L and T are constant in Model 2.

IV. The Quantitative Possibilities

The results of the last section are cumbersome and may be further elucidated by a brief sample of numerical examples. Moreover, some rough insight into the feasible range of results may be obtained if parameter values are chosen with one eye on the real world.

The empirical data (largely for the United States) are too widely known to require specific reference. Values are in terms of one-year periods whenever there is a dimensional dependence upon the time unit.

IV (i) *Numerical Results*

Model I

The marginal productivity of capital β_1 is determined as a function of the initial capital elasticity ϵ_1 and the initial capital—output ratio by setting the reciprocal of the latter at 0·3. By definition,

$$\beta_1 = 0{\cdot}3\ (\epsilon_1)$$

It is assumed constant throughout and the same for both cases. Then, if excess capacity is a constant proportion ξ, if L and T are constant, and if the time elapsed is 100 years, $X''(t)/X'(t)$ takes on the values shown in Table I[1] for the indicated constellations of parameter values.

TABLE I

$\alpha_2 = 0{\cdot}3$, $t = 100$	$\epsilon_1 = 0{\cdot}2$	$\epsilon_1 = 0{\cdot}5$
$\xi = 0{\cdot}02$	1·04	1·09
$\xi = 0{\cdot}05$	1·09	1·25
$\xi = 0{\cdot}10$	1·20	1·57

Thus, according to the parameter values, elimination of excess capacity would produce a capacity between 4% and 57% greater—perhaps the most reasonable range being 10%—25%.

If excess capacity is cyclical rather than a constant proportion, there will generally be some divergence from these

[1]The figures are calculated from exp.$[\beta_1\alpha_2\xi t]$ and rounded. Note that α_2 is approximately the observed short-run marginal propensity to save.

results. The maximum deviation for the bottom, right-hand cell of Table I would, however, only be about 0·02[1]—half being due to the deviation of $X''(t)/X'(t)$ from its trend, and the other half to the possible distortion of this trend by a particular initial phase of the cycle. With such a small quantitative effect, it seems justifiable to concentrate on the average proportion of excess capacity and neglect the cycles.

MODEL II

The limit approached over time by $X''(t)/X'(t)$, whether L and T are increasing or not, takes on the values shown in Table II for the indicated sets of parameters.[2]

TABLE II

	$a_1 = a_2$			$a_2=0{\cdot}3$; a_1-a_2 $\xi=0{\cdot}15$			$a_2=0{\cdot}4$; a_1-a_2 $\xi=0{\cdot}1$		
	$\epsilon_1=0{\cdot}2$	$\epsilon_1=0{\cdot}4$	$\epsilon_1=0{\cdot}5$	$\epsilon_1=0{\cdot}2$	$\epsilon_1=0{\cdot}4$	$\epsilon_1=0{\cdot}5$	$\epsilon_1=0{\cdot}2$	$\epsilon_1=0{\cdot}4$	$\epsilon_1=0{\cdot}5$
$\xi=0{\cdot}02$	1·01	1·01	1·02	1·01	1·03	1·04	1·02	1·05	1·08
$\xi=0{\cdot}05$	1·01	1·04	1·05	1·02	1·07	1·10	1·05	1·13	1·20
$\xi=0{\cdot}10$	1·03	1·07	1·11	1·05	1·13	1·20	1·09	1·25	1·40

The dependence upon ϵ_1, ξ, and the ratio of a_2 and a_1 is marked, and doubling any of these roughly doubles the result.

For finite t the values of $X''(t)/X'(t)$ will be less than these limits. For instance, the case corresponding to the extreme lower right-hand cell in Table II has the time paths shown in Table III.[3]

[1]Calculated from (16) by permitting $-(\cos \lambda - \cos\overline{\theta t + \lambda})$ to take on a maximum value of 2. (Given a ten-year cycle, this cosine term is always zero for $t = 100$ exactly—hence, the maximum deviation would then occur only in the neighbourhood of this value of t).

[2]Determined from $\lim\limits_{t\to\infty} (X''(t)/X'(t)) = \left(\dfrac{a_1}{a_1 - a_2\xi}\right)^{1/\Omega}$ and rounded.

Note that $a_1 - a_2\xi$ is approximately the observed long-run average propensity to save. (Compare Section III (iii)).

[3]Determined from (21) and rounded.

TABLE III

	t = 25	t = 50	t = 75	t = 100	t→∞
$\rho = 0{\cdot}015$	1·13	1·20	1·27	1·31	1·40
$\rho = 0{\cdot}00$	1·11	1·17	1·21	1·24	1·40

$\rho>0$ corresponds to growth of L and T in a " realistic " manner,[1] and its acceleration of the approach to the limit is clear.

IV (ii) *Implications*

To apply the results just obtained to the experience of western economies over the past hundred years is undoubtedly pretentious. Yet not to do so evades an important problem. For, while we know that depressions have involved an immediate and clearcut loss of output their long-run effects are less clear, although more lasting and, in that sense, more serious. What we can say, if we are simple-minded enough to believe that complex reality can be distilled into a few quantitative relations, is that it does not seem unreasonable to suppose that, over the past hundred years, elimination of excess capacity would have raised capacity by some 5—15%. Considerably greater values than this cannot be ruled out, but require " unfavourable " assumptions about all three types of parameters—saving, production and cyclical. And if only one fails, the divergence of X'' from X' will be limited. Thus, cycles of post-war proportions are hardly likely to to give a significant divergence, whereas a succession of " Great Depressions " might.

It hardly needs to be stressed that all such conclusions rest upon the underlying assumptions, and that inappropriateness here can involve an undetermined bias. Given the limitations upon empirical observation, such a difficulty seems inherent in the comparative-dynamic approach, for there is really no way of inferring what would have happened in the hypothetical situation with all but a few factors unchanged. But a less casual form of empiricism would undoubtedly inspire more confident assumptions.

[1] $\rho = \epsilon_2\frac{\dot{L}}{L}+\delta\frac{\dot{T}}{T}$ (when $\frac{\dot{L}}{L}$ and $\frac{\dot{T}}{T}$ are assumed constant). If $\epsilon_2=0.5$ and $\delta=1$, then $\frac{\dot{L}}{L} = 0.01 = \frac{\dot{T}}{T}$ gives the value $\rho=0.015$ used in Table III.

V. Applications

The first application examined has greatest importance if the deviation of $X''(t)$ and $X'(t)$ is thought to be small, and the second becomes significant in the opposite case.

V. (i) *Econometric models of long-run trends*

The device of introducing the pattern of cycles as an exogenous deviation from capacity might prove helpful in the construction of models which are to be statistically tested against long-run trends or used for parameter estimation. The alternative of a complete model—" explaining " the short-run behaviour of effective demand as well as the long-run growth of capacity—is likely to be cumbersome, involving, as it does, a generalisation of the Tinbergen-Klein methods.

The reasonableness of the approximate procedure will be increased if the effect of the cycles upon long-run development is small anyway. Indeed, if it is very small, use of a simple " classical " model, with output always at capacity, may give results within the range of accuracy desired or feasible. On the other hand, if the effect of cycles has, in fact, been substantial then estimation of structural parameters by use of a " classical " model will involve some kind of bias.

V. (ii) *The historical, capital-output ratio and " equilibrium " growth*

Aside from the inherent danger of extrapolating past experience, the use of historical figures on the capital/capacity-output ratio[1] to forecast the growth rates required for balance between aggregate demand and capacity may involve a bias. For the relevant data would be those for an observed period of " equilibrium " growth, and the historical figures do not seem to satisfy this condition. On the contrary, the occurrence of cycles means that the capital-stock will generally differ from the one which might have been accumulated in their absence. And there is no reason to think that L and T could have been altered by the cycles just sufficiently to preserve the capital/labour/output ratios which would have appeared with " equilibrium " growth.

[1]This seems to be a better indicator of the productivity of capital than the capital/actual-output ratio.

To take a specific example, suppose L and T are exogenous and that the Cobb-Douglas production function (13) applies. Then, comparing a " classical " (or " equilibrium ") case with a " cyclical " (or realistic) one starting from the same position, the capital-output ratios after t years have elapsed are related by[1]

$$\frac{K''(t)}{X''(t)} = \left(\frac{X''(t)}{X'(t)}\right)^{\frac{1}{\epsilon_1}-1} \frac{K'(t)}{X'(t)} \tag{25}$$

when the double prime distinguishes the " classical " case and ϵ_1 is the capital elasticity of output. If $X''(t)/X'(t) = 1{\cdot}20$ and $\epsilon_1 = 0{\cdot}25$, then the " classical ", capital/capacity ratio will be $(1{\cdot}20)^3 = 1{\cdot}73$ times the " cyclical ". Thus, if the historical experience was a capital/capacity ratio remaining constant at 3 over the t years, the elimination of cycles to give equilibrium growth over the whole period would have produced a ratio rising from 3 to 3 x 1·73 = 5·19. In this situation there would be little plausibility in assuming that the behaviour of the ratio in the *next* t years, if these are to be of " equilibrium " growth, would correspond to that observed in the *past* t years of " cyclical " growth.

Arguing along these lines, any supposed historical constancy of the capital-output ratio would seem to be of dubious significance for models of " equilibrium " growth. For, had the observed period been somehow re-enacted as one of equilibrium growth, the expectation (at a first approximation) is that the ratio would have shown a rising trend.

VI. Conclusions

(i) The existence of excess capacity, due to output cycles or some other failure of effective demand, can have a substantial effect upon the expansion of capacity. But the proportionate loss is unlikely to be very large over periods of a hundred years or less, providing that the average proportion of excess capacity is itself not large.

(ii) The results obtained by assuming that excess capacity is steady at the average level of the cycles generally differ from

[1] $K''(t) = (X''(t))^{1/\epsilon_1}\,\phi(t)$ and similarly for $K'(t)$, when $\phi(t)$ represents the exogenous factors and is the same for both cases. Note that for a *given* ratio $X''(t)/X'(t)$ the ratio of capital-capacity ratios for the two cases *increases* as ϵ_1 diminishes. But of course, given other relevant factors $X''(t)/X'(t)$ is likely to be lower the lower is ϵ_1.

those obtained if the cyclical behaviour is taken into account. But the difference is sufficiently small to be ignored practically.

(iii) These conclusions are dependent upon the underlying assumptions and are, at best, of limited quantitative significance. Greatest error is likely to stem from the supposition that development of the labour force and technology would be unaffected by the suppression of cycles. But failure of any assumption cannot be regarded as having a simple additive effect. For it will usually induce further repercussions upon accumulation, so that the final result can only be judged in terms of the complete model.

(iv) It may prove useful—as a kind of simplifying device of "partial" analysis—to introduce the behaviour of excess capacity into models of long-run development as an exogenous factor.

(v) The historical behaviour of the capital-output ratio may not approximate that which would have appeared had excess capacity been eliminated.

Appendix—The solution of equation (18).

Rewrite the equation, which is of the Bernoulli form,[1] as

$$\dot{X} = \{a_1 - a_2\nu(t)\}\Psi(t)\, X^{1-\Omega} + \rho(t)X$$

$$\left\{\begin{array}{l} \Psi(t) = \epsilon_1\,[L(t)^{\epsilon_1}\{\beta T(t)^{\delta}\}]^{1/\epsilon_1} \\ \rho(t) = \epsilon_2 \dfrac{\dot{L}(t)}{L(t)} + \delta\dfrac{\dot{T}(t)}{T(t)} \\ \Omega = \dfrac{1}{\epsilon_1} - 1 \end{array}\right.$$

Multiplying through by $\Omega X^{\Omega-1}$ converts this to the *linear* equation,

$$\dot{Y} = \Omega\,[\rho(t)Y + \{a_1 - a_2\nu(t)\}\Psi(t)]$$

when $Y = X^{\Omega}$. The solution is[2]

$$Y(t) = e^{\Omega\int_0^t\rho(t)dt}\left[\Omega\int_0^t\{a_1 - a_2\nu(t)\}\Psi(t)\left(e^{-\Omega\int_0^t\rho(t)dt}\right)dt + Y(0)\right]$$

Now use the identity $\displaystyle\int_0^t\rho(t) \equiv \int_{L(0)}^{L(t)}\epsilon_2\frac{dL(t)}{L(t)} + \int_{T(0)}^{T(t)}\delta\frac{dT(t)}{T(t)}$

[1]Compare Piaggio, *op. cit.*, paragraph 21.
[2]*Ibid.*, paragraph 19.

to obtain

$$e^{\pm \Omega \int_0^t \rho(t)dt} = \left[\left\{\frac{L(t)}{L(0)}\right\}^{\epsilon_2}\left\{\frac{T(t)}{T(0)}\right\}^{\delta}\right]^{\pm\Omega} = \left[\frac{\overline{X}(t)}{X(0)}\right]^{\pm\Omega} = \left[\frac{\overline{Y}(t)}{Y(0)}\right]^{\pm 1}$$

when the bar denotes that the capital stock is constant at the initial level.

Substituting in the solution, Y (0) cancels and $\Psi(t)/\overline{Y}(t)$ reduces to

$$\epsilon_1 K(0)^{\epsilon_1 - 1} L(t)^{\epsilon_2}\{\beta T(t)^{\delta}\} = \frac{\overline{\partial X}}{\partial K}(t).$$

Hence, taking the $1/\Omega$th power,

$$X(t) = \overline{X}(t)\left[1 + \Omega\int_0^t \{a_1 - a_2\nu(t)\}\frac{\overline{\partial X}}{\partial K}(t)dt\right]^{1/\Omega} \tag{19}$$

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A Monthly Index of Wage-Rates by Industries

The monthly index of wage-rates by industries is given for the period January, 1958 to May, 1959, for all adults, and for men and women separately. The industry groups are the Orders of the 1948 Standard Industrial Classification. 1948 is taken as 100, and the wage-bills of that year are used as weights.

For figures for earlier years, and a full account of the sources and methods used, see "An Index of Wage-Rates by Industries," Ely Devons and R. C. Ogley, *The Manchester School*, May, 1958, and "A Monthly Index of Wage-Rates by Industries," J. R. Crossley, *Ibid.*, May, 1959.

Some of the figures now given for recent months may subsequently be revised to take account of later information about wage-rate changes having a retrospective effect.

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MONTHLY WAGE RATE INDEX BY INDUSTRIES. ADULT WORKERS

S.I.C. Orders		I	II	III	IV	V	VI			VII	VIII	IX	X	
	Total All Industries	Agriculture, Forestry and Fishing	Mining and Quarrying	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	56	79	19	18	39	102	14	74	61	25	7	46	14
1958 JAN.	166·4	167·3	168·1	163·5	167·0	175·3	169·5	171·0	169·3	164·0	170·5	163·1	159·8	152·4
FEB.	166·7	167·3	168·1	164·2	167·0	175·6	169·7	171·0	169·5	164·0	170·5	163·1	159·8	152·4
MAR.	167·0	167·3	168·1	164·2	167·0	175·6	169·7	171·0	169·5	164·0	170·5	163·1	159·8	152·4
APL.	167·1	167·3	168·1	164·2	167·6	175·3	169·7	171·0	169·5	164·0	170·5	163·1	159·9	152·4
MAY	167·3	167·3	168·1	164·2	167·6	175·6	169·7	171·0	169·5	164·0	170·5	163·1	160·8	152·4
JUNE	167·6	167·3	168·2	165·6	167·6	176·6	169·7	171·0	169·6	164·0	171·6	163·1	161·3	152·4
JULY	168·7	167·3	168·2	166·1	167·7	176·6	169·8	171·0	169·6	165·2	171·6	163·3	161·3	152·4
AUG.	169·2	167·3	168·2	167·1	167·9	177·0	169·8	171·0	169·7	165·2	172·4	163·3	161·6	152·4
SEPT.	169·4	167·3	168·2	167·4	171·0	175·7	169·9	171·0	169·7	165·2	172·5	163·3	161·5	152·6
OCT.	171·1	167·3	174·5	168·3	174·1	176·9	175·9	177·9	175·4	168·8	174·2	163·2	161·4	152·6
NOV.	171·7	172·6	174·6	168·5	174·3	176·9	176·1	177·9	175·5	168·8	174·6	163·2	162·4	152·6
DEC.	172·1	173·9	174·7	168·7	174·3	177·9	176·2	177·9	175·7	169·7	174·6	166·5	162·6	152·8
Annual Average 1958	168·7	168·3	169·8	166·2	169·4	176·3	171·3	172·7	171·0	165·6	172·0	163·5	161·0	152·5
1959 JAN.	172·2	173·9	174·7	168·7	174·3	178·0	176·2	177·9	175·7	169·9	175·8	167·2	163·0	152·8
FEB.	172·7	173·9	174·7	168·8	174·3	178·5	176·4	177·9	176·0	169·9	176·4	167·2	163·2	152·8
MAR.	173·0	173·9	174·8	169·2	174·3	182·6	176·4	177·9	176·0	169·9	176·4	167·2	163·4	153·1
APL.	173·0	173·9	174·8	169·9	174·4	182·6	176·5	177·9	176·1	169·9	176·4	167·3	163·5	153·1
MAY	173·1	173·9	174·8	169·9	174·4	182·6	176·5	177·9	176·1	169·9	176·4	167·3	164·2	153·1

XI	XII	XIII	XIV	XV	XVI	XVII		XVIII	XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Gas, Water and Electricity	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
4	27	37	17	24	11	114	78	20	98	80	29	12	75
169·9	163·9	167·8	176·3	177·3	162·5	167·5	167·5	173·4	162·6	166·8	169·2	161·3	156·2
169·9	166·0	168·3	176·3	177·5	162·5	171·0	170·7	173·4	162·6	166·8	169·5	161·3	156·2
169·9	166·0	168·3	176·3	177·6	162·5	171·0	170·7	173·4	162·6	167·4	169·5	161·3	156·2
169·9	168·8	168·6	176·3	177·6	162·5	171·0	170·7	173·4	162·6	167·7	169·5	161·3	156·2
169·9	169·9	168·8	178·1	177·6	162·9	171·0	170·7	176·6	162·6	167·7	169·5	161·3	156·2
169·9	169·8	169·5	178·3	177·9	162·9	171·0	170·7	176·6	162·6	169·4	169·5	161·3	157·1
169·9	171·1	171·5	179·7	179·8	164·2	174·1	173·7	176·6	164·9	171·5	169·8	161·3	157·1
169·9	171·7	171·8	180·2	179·8	164·2	174·1	173·7	179·5	165·1	172·8	174·3	168·1	157·4
169·9	171·8	172·6	180·4	179·7	164·7	174·1	173·7	181·3	165·6	173·1	174·3	168·1	157·4
170·9	171·8	174·0	180·1	180·8	169·5	174·3	173·8	181·6	165·6	173·3	174·3	168·1	158·6
176·1	171·8	174·0	180·3	180·8	169·5	174·4	173·8	181·7	167·3	173·3	174·6	168·1	158·6
176·1	171·9	174·0	180·3	180·8	169·5	174·4	173·8	181·7	168·2	173·3	175·2	168·1	159·6
171·0	169·5	170·8	178·6	178·9	164·8	172·3	172·0	177·4	164·4	170·3	171·6	164·1	157·2
176·2	171·9	174·6	180·6	180·9	169·5	174·4	173·8	181·8	168·2	173·3	175·2	168·1	159·6
176·2	171·9	174·9	180·9	181·0	169·5	177·2	176·8	181·8	168·2	173·5	175·2	168·1	159·6
176·2	171·9	174·9	180·9	181·0	169·5	177·2	176·8	181·8	168·2	173·5	175·2	168·1	161·5
176·2	172·3	174·9	181·6	181·0	169·5	177·2	176·8	181·8	168·2	173·5	175·2	168·1	161·5
176·2	172·3	175·1	182·1	181·0	171·4	177·2	176·8	181·8	168·2	173·8	175·2	168·1	161·5

MONTHLY WAGE RATE INDEX BY INDUSTRIES. MEN

S.I.C. Orders		I	II	III	IV	V	VI			VII	VIII	IX	X	
	Total All Industries	Agriculture, Forestry and Fishing	Mining and Quarrying	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	61	94	20	19	45	111	16	79	69	24	6	31	8
1958 JAN.	166·3	167·2	168·1	164·2	166·1	175·2	169·3	171·0	169·0	163·2	168·3	162·2	159·6	152·2
FEB.	166·9	167·2	168·1	164·9	166·1	175·6	169·5	171·0	169·2	163·2	168·3	162·2	159·6	152·2
MAR.	167·0	167·2	168·1	164·9	166·1	175·6	169·5	171·0	169·2	163·2	168·3	162·2	159·6	152·2
APL.	167·1	167·2	168·1	165·6	166·7	175·3	169·5	171·0	169·2	163·2	168·3	162·2	159·9	152·2
MAY	167·3	167·2	168·1	165·6	166·7	175·6	169·5	171·0	169·2	163·2	168·3	162·2	160·8	152·2
JUNE	167·5	167·2	168·2	166·3	166·7	176·6	169·6	171·0	169·3	163·2	169·4	162·2	161·2	152·2
JULY	168·8	167·2	168·2	166·5	166·8	176·6	169·6	171·0	169·3	164·4	169·4	162·4	161·3	152·2
AUG.	169·3	167·2	168·2	167·5	167·0	177·1	169.6	171·0	169·4	164·4	170·1	162·4	161·6	152·2
SEPT.	169·5	167·2	168·2	167·9	168·7	175·6	169·7	171·0	169·5	164·4	170·2	162·4	161·5	152·5
OCT.	171·5	167·2	174·5	168·9	173·1	176·9	175·8	177·9	175·2	168·1	171·9	162·3	161·4	152·5
NOV.	172·1	172·5	174·6	169·1	173·2	176·9	175·9	177·9	175·4	168·1	172·3	162·3	162·5	152·5
DEC.	172·5	173·9	174·7	169·3	173·3	177·8	176·0	177·9	175·5	169·0	172·3	165·5	162·8	152·7
Annual Average 1958	168·8	168·2	169·8	166·7	168·4	176·2	171·1	172·7	170·8	164·8	169·8	162·5	161·0	152·3
1959 JAN.	172·6	173·9	174·7	169·3	173·3	177·9	176·0	177·9	175·5	169·1	173·5	165·5	163·2	152·7
FEB.	173·1	173·9	174·7	169·4	173·3	178·4	176·2	177·9	175·8	169·1	174·0	166·0	163·4	152·7
MAR.	173·4	173·9	174·8	169·9	173·3	182·5	176·2	177·9	175·8	169·1	174·0	166·2	163·5	153·0
APL.	173·4	173·9	174·8	170·3	173·4	182·5	176·3	177·9	175·9	169·1	174·0	166·4	163·8	153·0
MAY	173·5	173·9	174·8	170·3	173·4	182·5	176·3	177·9	175·9	169·1	174·0	166·4	164·4	153·0

XI	XII	XIII	XIV	XV	XVI	XVII		XVIII	XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Gas, Water and Electricity	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
4	15	35	18	23	11	135	92	23	111	65	34	5	41
167·7	158·7	166·7	174·8	176·3	160·9	167·5	167·5	173·4	160·4	166·4	169·2	162·7	155·2
167·7	161·0	167·2	174·8	176·4	160·9	171·0	170·7	173·4	160·4	166·4	169·2	162·7	155·2
167·7	161·0	167·2	174·8	176·6	160·9	171·0	170·7	173·4	160·4	166·9	169·4	162·7	156·2
167·7	163·2	167·6	174·9	176·6	160·9	171·0	170·7	173·4	160·4	167·2	169·4	162·7	156·2
167·7	163·5	167·7	176·7	176·6	161·1	171·0	170·7	176·6	160·4	167·2	169·4	162·7	156·2
167·7	163·5	168·4	176·9	176·9	161·1	171·0	170·7	176·6	160·4	169·2	169·4	162·7	156·2
167·7	163·9	170·6	178·4	178·7	162·3	174·1	173·7	176·6	164·3	170·5	169·8	162·7	157·0
167·7	165·0	170·8	178·7	178·7	162·3	174·1	173·7	179·5	165·0	172·1	174·3	162·7	157·3
167·7	165·0	171·8	178·9	178·7	162·9	174·1	173·7	181·3	165·5	172·4	174·3	169·6	157·3
169·4	165·0	172·9	178·7	179·9	170·5	174·3	173·8	181·6	165·5	172·6	174·3	169·6	159·0
174·8	165·0	172·9	178·9	179·9	170·5	174·4	173·8	181·7	167·2	172·6	174·6	169·6	159·0
174·8	165·1	172·9	178·9	179·9	170·5	174·4	173·8	181·7	168·1	172·6	175·2	169·6	160·6
169·0	163·3	169·7	177·1	177·9	163·7	172·3	172·0	177·4	163·2	169·7	171·5	165·0	157·1
174·9	165·1	173·6	179·2	179·9	170·5	174·4	173·8	181·8	168·1	172·6	175·2	169·6	160·6
174·9	165·1	173·8	179·4	180·0	170·5	177·2	176·8	181·8	168·1	172·9	175·2	169·6	160·6
174·9	165·1	173·8	179·4	180·0	170·5	177·2	176·8	181·8	168·1	172·9	175·2	169·6	162·3
174·9	165·4	173·8	180·1	180·0	170·5	177·2	176·8	181·8	168·1	172·9	175·2	169·6	162·3
174·9	165·4	173·8	180·5	180·0	171·6	177·2	176·8	181·8	168·1	173·3	175·2	169·6	162·3

MONTHLY WAGE RATE INDEX BY INDUSTRIES. WOMEN

S.I.C. Orders		I	III	IV	V	VI			VII	VIII	IX	X	
	Total All Industries	Agriculture, Forestry and Fishing	Treatment of Non-Metalliferous Mining Products	Chemical and Allied Trades	Metal Manufacture	Total Shipbuilding, Engineering and Electrical Goods	Shipbuilding	Engineering	Vehicles	Metal Goods N.E.S.	Precision Instruments, Jewellery, etc.	Total Textiles	Cotton
Weights	1000	31	14	14	9	55	1	49	19	29	8	123	48
1958 JAN.	166·0	168·0	158·5	172·8	186·2	186·4	171·2	187·4	186·4	177·1	166·9	160·0	152·3
FEB.	166·2	168·0	159·3	172·8	186·2	186·5	171·2	187·6	186·4	177·1	166·9	160·0	152·3
MAR.	166·4	168·0	159·3	172·8	186·2	186·5	171·2	187·6	186·4	177·1	166·9	160·0	152·3
APL.	166·8	168·0	162·2	173·6	186·2	186·6	171·2	187·6	186·4	177·1	166·9	160·1	152·3
MAY	167·0	168·0	162·2	173·6	186·2	186·6	171·2	187·6	186·4	177·1	166·9	160·9	152·3
JUNE	167·4	168·0	162·4	173·6	186·2	186·6	171·2	187·6	186·4	178·1	166·9	161·3	152·3
JULY	168·6	168·0	162·5	173·7	186·2	186·6	171·2	187·6	186·8	178·1	167·0	161·2	152·3
AUG.	169·1	168·0	163·5	173·8	186·2	186·6	171·2	187·7	186·8	179·4	167·0	161·5	152·3
SEPT.	169·5	168·0	163·7	176·6	186·2	186·7	171·2	187·8	186·8	179·4	167·0	161·4	152·6
OCT.	170·5	168·0	164·4	180·6	194·4	193·3	178·4	194·2	189·1	181·3	166·9	161·4	152·6
NOV.	170·8	173·4	164·4	180·7	194·4	193·3	178·4	194·2	189·1	181·3	166·9	162·2	152·6
DEC.	171·2	174·8	164·6	181·0	194·4	193·5	178·4	194·4	189·6	181·3	170·5	162·4	152·8
Annual Average 1958	168·3	169·0	162·3	175·5	188·3	188·3	173·0	189·3	187·2	178·7	167·2	161·0	152·4
1959 JAN.	171·4	174·8	164·6	181·0	194·4	193·5	178·4	194·4	191·3	183·5	170·5	162·8	152·8
FEB.	171·5	174·8	164·6	181·0	194·4	193·6	178·4	194·6	191·3	184·3	171·3	163·0	152·8
MAR.	172·1	174·8	164·6	181·0	194·4	193·7	178·4	194·6	191·3	184·3	171·3	163·0	152·8
APL.	172·2	174·8	166·9	181·2	194·4	193·8	178·4	194·7	191·3	184·3	171·4	163·1	152·8
MAY	172·3	174·8	166·9	181·2	194·4	193·8	178·4	194·7	191·3	184·3	171·4	163·7	152·8

XI	XII	XIII	XIV	XV	XVI	XVII		XIX	XX	XXII	XXIII	XXIV
Leather, Leather Goods and Fur	Clothing	Food, Drink and Tobacco	Manufacture of Wood and Cork	Paper and Printing	Other Manufacturing Industries	Total Building and Contracting	Building	Transport and Communications	Distributive Trades	Public Administration and Defence	Professional Services	Miscellaneous Services
5	95	50	9	26	17	1	1	30	161	2	47	255
184·7	168·1	171·4	193·5	182·4	168·3	192·6	192·6	163·1	167·9	175·6	160·5	155·8
184·7	170·2	171·7	193·5	182·9	168·3	197·1	197·1	163·1	167·9	175·6	160·5	155·8
184·7	170·2	171·7	193·5	183·0	168·3	197·1	197·1	163·1	168·7	175·6	160·5	155·8
184·7	173·2	171·9	193·5	183·0	163·3	197·1	197·1	163·1	168·7	175·6	160·5	155·8
184·7	174·9	171·9	194·3	183·0	169·1	197·1	197·1	163·1	168·7	175·6	160·5	155·8
184·7	174·9	173·6	194·4	183·1	169·1	197·1	197·1	163·1	169·9	175·6	160·5	155·8
184·7	175·2	174·8	196·9	186·1	171·0	201·6	201·6	167·2	173·8	175·6	160·5	156·6
184·7	177·2	174·9	196·9	186·1	171·0	201·6	201·6	167·2	174·3	175·6	160·5	157·0
184·7	177·3	175·2	197·0	186·1	171·0	201·6	201·6	167·2	174·7	175·6	167·2	157·0
186·1	177·3	177·6	195·6	187·0	176·4	201·6	201·6	167·2	174·8	175·6	167·2	157·8
190·0	177·3	177·6	196·1	187·0	176·4	201·6	201·6	167·2	174·8	175·6	167·2	157·8
190·0	177·4	177·6	196·1	187·0	176·4	201·6	201·6	169·5	174·8	175·6	167·2	158·5
185·7	174·4	174·2	195·1	184·7	171·1	199·0	199·0	165·3	171·6	175·6	162·7	156·6
190·6	177·4	177·8	196·6	187·0	176·4	201·6	201·6	169·5	174·8	175·6	167·2	158·5
190·6	177·4	178·5	196·6	187·5	176·4	206·2	206·2	169·5	174·8	175·6	167·2	158·5
190·6	177·4	178·5	196·6	187·5	176·4	206·2	206·2	169·5	175·0	175·6	167·2	160·6
190·6	177·9	178·5	198·2	187·5	176·4	206·2	206·2	169·5	175·0	175·6	167·2	160·6
190·6	177·9	178·5	198·7	187·5	178·1	206·2	206·2	169·5	175·0	175·6	167·2	160·6

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